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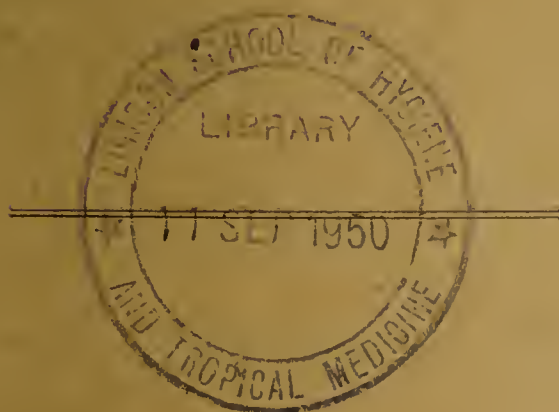
ANNUAL REPORT

OF THE

MEDICAL RESEARCH
INSTITUTE

FOR THE YEAR

1927.



LAGOS :

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APPENDIX A.

ANNUAL REPORT OF THE MEDICAL RESEARCH
INSTITUTE, 1927.

BY

ANDREW CONNAL, M.D., D.P.H., D.T.M. AND H.

Director of Medical Research Institute.

MEDICAL RESEARCH INSTITUTE,
LAGOS, NIGERIA.

5th April, 1928.

SIR,

I have the honour to present the Annual Report of the Medical Research Institute for 1927.

2. Attention was mainly concentrated on Rat Plague.
3. The work on skin diseases has been continued, as far as possible, by Dr. E. C. Smith.
4. The usual synopsis of the blackwater fever cases is included.
5. The Director proceeded on leave on 23rd September, 1927.
6. The Honorary Entomologist also proceeded on leave on that date.
7. The Bacteriologist, Dr. E. C. Smith, proceeded on leave on 28th January, 1927, and returned to duty on 15th September, 1927.
8. Dr. J. A. Young, M.C., on appointment as second Bacteriologist, assumed duty on 6th January, 1927. Unfortunately he early received injuries which necessitated a long stay in hospital. He was invalided on 12th August, 1927.
9. Dr. J. C. Paisley, who had been detailed for Rat Plague at Ereko Dispensary, proceeded to Minna on 24th August, 1927.
10. Dr. B. G. T. Elmes took over the duties at Ereko Dispensary on 23rd September, 1927.
11. Dr. G. V. Fiddian was detailed for Bacteriological work on 21st September, 1927, but was transferred to Jos on 22nd December, 1927.
12. Mr. E. F. Hines, Technical Assistant, proceeded on leave on 7th March, 1927, and returned to duty on 26th July, 1927.
13. Mr. F. W. Randall, Technical Assistant, proceeded on leave on 15th July, 1927, and resumed duty on 15th December, 1927.
14. Mr. R. A. Martins assumed duty as First Class Clerk, on promotion, on 4th July, 1927, *vice* Mr. D. O. Runsewe.
15. The Government Analyst was separated from the Medical Research Institute as from 1st April, 1927.

I have the honour to be,

Sir,

Your obedient Servant,

A. CONNAL,

Director of Medical Research Institute.

THE HONOURABLE

THE DIRECTOR OF MEDICAL AND SANITARY SERVICE.

RAT PLAGUE.

The work of examining the rodents of Lagos was continued at Ereko Dispensary. During the first part of the year, Dr. J. C. Paisley was in charge of the dissections and in the latter half of the year Dr. B. G. T. Elmes took over his duties. Corporal Bowrey assisted during the whole period. The rodents were provided principally from the "Collecting Stations," of which there are three—Egerton Square, Idumagbo and Evans Street. These stations were instituted for the purpose of receiving the rats brought in by the town inhabitants themselves, a sum of money being paid for each animal; more than half of the total rodents each day came from this source. The official rat-catchers supplied about one-third of the daily total, about ten *per cent.* came from the official "Spray Gangs" and the Port Health Office sent along all rats found when ships or sheds were fumigated.

The total number of rats dealt with at Ereko Dispensary was 56,182, made up of 51,621 black rats (*R. rattus*), 4,292 brown rats (*R. norvegicus*) and 269 rats of a kind which has been labelled "Swamp-rat," pending identification by the authorities at the British Museum (Natural History).

In addition, 3,454 specimens of the shrew (*Crocidura manni*) were examined. No specimens of the pouched rat (*Cricetomys gambianus*), or of the striped rat (*Lemniscomys fasciatus*), which figured in previous reports, have been met with.

Each rat, when it was brought to the laboratory, was given a number, which was entered in a register and also marked on a glass slide, so that, except in the case of material received from the collecting stations (where no names or addresses were taken because of the likelihood of scaring the volunteers), it was possible to tell at once the locality where an infected rat had been caught.

After being registered each rat was pinned out, belly uppermost, and dissected, to expose first the lymphatic glands of the neck axilla and groin, and secondly the abdominal and thoracic cavities were opened. A smear was taken from the cut surface of the spleen of each animal and stained and microscopically examined as a routine. Where there was any suspicion of disease, other smears were taken from glands and organs.

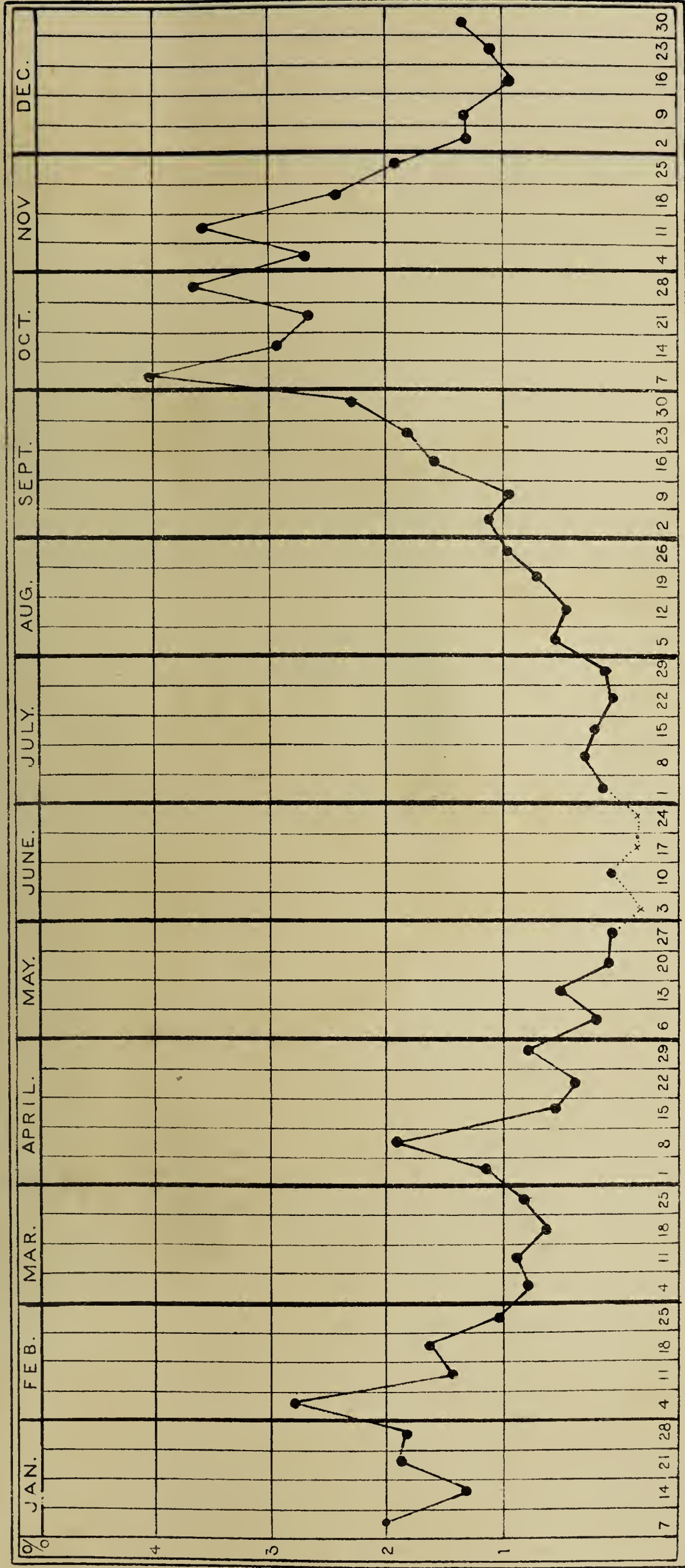
The daily number of mice brought in invariably outnumbered the rats very considerably, so that with the staff available it was quite impossible to submit them to the same careful examination which the rats received. Previous experience of the mice, however, had shown that the percentage infected was very small, so that there was no justification for increasing the staff in order to ensure that they were all examined. It was decided, therefore, to open as many mice each day as time would permit, simply taking a spleen smear for examination, and in this way the total number examined was 20,519, which brings the rodent total up to 76,701, to which the number of live rats examined has still to be added.

Live rats were sent in special cages to the Research Institute, where they were chloroformed, searched for fleas and afterwards dissected. The total thus examined was 867, made up of 804 black rats, fifty-one brown rats and twelve swamp rats. The total was therefore 77,568 rodents examined.

In addition to these, spleen smears from rats were sent from Abeokuta (including Owode) and from Ibadan, and towards the end of

CHART. N^o 1.

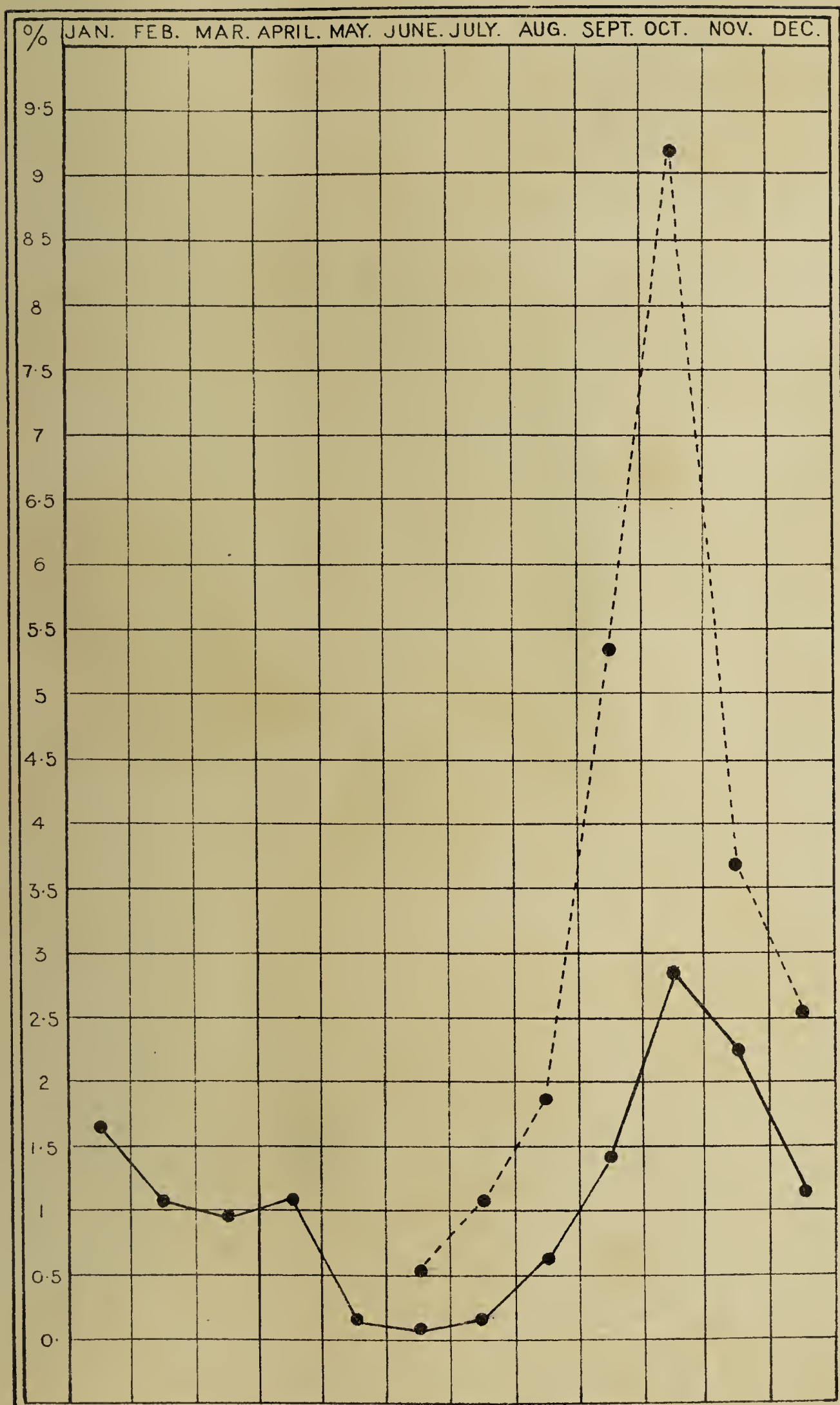
SHOWING WEEKLY PERCENTAGE OF INFECTED RATS.



Reproduced by the Survey Department Lagos.

CHART. N^o 2.

SHOWING MONTHLY PERCENTAGE OF INFECTED RATS.



BROWN RATS. ---●---
BLACK RATS. —●—

the year smears also came in from Ifo. The total number of smears from these sources was 29,630.

As each rodent and shrew examined in Lagos represented at least one smear (in many cases several smears were made from one animal) the total number of slides examined was therefore over 110,652, an average of over 300 per day throughout the year.

Dealing with the dissections in Lagos, the following are the main features. In 51,621 black rats examined there were 573 found to be plague-infected. In 4,292 brown rats there were 103 plague-infected. There were no positive findings in the mice, in the "swamp" rats or in the shrews. The highest number of rats dissected in one day was 299, and the average number was 154. On Sundays and holidays no rats came in from the collecting stations so that on these days only from thirty to fifty rats were received.

The proportion of infected rats varied considerably at different periods of the year. It was highest over a monthly period, in October, when 3.22% of 5,443 rats were positive. The highest over a weekly period was in the first week of October when 4.10% of 1,201 rats were proved infected, and the highest number in one day was on 5th October, when twelve out of 176 rats were positive.

There were three complete weekly periods in the year when no positive rats were found, namely, 28th May to 3rd June (937 rats), 11th to 17th June (1,015 rats), and 18th to 24th June (1,396 rats). The longest period was from 10th to 29th June inclusive, when 3,406 rats were examined and no plague-infection was found. The month with the lowest number of positive findings was June, in which month out of 4,872 rats examined, only three, or 0.06% were positive.

Chart 1 shows the weekly fluctuations.

The monthly figures are given in Table I. (Overleaf.)

Chart 2 shows the monthly percentage infection in the black and the brown rat.

Except during the first five months of the year, the plague-infected percentage was higher in the brown rats than in the black. It is difficult to explain the non-finding of infection in the brown rats during February, March, April and May, but it will be observed that the infection in the black rats was low during the same period.

Source of the Infected Rats.—The three Collecting Stations supplied 568 infected rats, the official rat-catchers brought in 54, 50 came from the Spray gangs and the Port Health Office provided three. It is evident, therefore, that but for the policy adopted by the Chief Plague Medical Officer to encourage the inhabitants of Lagos to bring in rats, the extent of the plague infection in the rodents would have been gravely under-estimated. The explanation of the large number of infected rats from the Collecting Stations source is that the sick or dying rat is easily caught and the dead rat has merely to be picked up and handed in at the collecting station where the monetary award is promptly obtained. Had there been no reward, the sick rats might possibly have been killed and the dead rats would almost certainly have been thrown into a neighbouring compound in order to divert the unappreciated attentions of the Sanitary Disinfecting Staff.

Buboes.—These were present in 578 infected rats. Of the remaining ninety-eight positive cases, no glandular swellings were observed in seventy-four, decomposition was too far advanced for accurate observation in twenty-two and in two cases a swollen gland was negative in a stained smear, on cultivation and on animal inoculation. The presence of plague in these three groups of cases was diagnosed on spleen smears or on spleen and liver smears. It will be

TABLE I.

	Black rat.	Positive.	Per cent.	Brown rat.	Positive.	Per cent.	"Swamp rat."	Total rodents.	Positive.	Per cent.
January ...	3,332	57	1.71	237	3	1.26	16	3,585	60	1.67
February	3,140	32	1.01	281	...	...	31	3,452	32	0.92
March...	3,721	37	0.99	287	...	...	2	4,010	37	0.92
April ...	3,239	33	1.01	300	...	...	...	3,539	33	0.93
May ...	3,936	9	0.22	371	...	...	46	4,353	9	0.20
June ...	4,361	1	0.02	373	2	0.53	138	4,872	3	0.06
July ...	5,305	7	0.13	478	5	1.04	9	5,792	12	0.20
August	5,592	32	0.57	485	9	1.85	1	6,078	41	0.67
September	5,033	71	1.41	469	25	5.33	4	5,506	96	1.74
October	5,004	141	2.81	434	40	9.21	5	5,443	181	3.32
November	4,563	104	2.27	301	11	3.65	17	4,881	115	2.35
December	4,395	49	1.11	276	8	2.89	...	4,671	57	1.22
Totals	51,621	573	1.11	4,292	103	2.39	269	56,182	676	1.20

Chart (2) shows the monthly percentage infection in the black and the brown rat

noted, then that buboes were absent, not observable or negative in 14.49 *per cent.* of the infected rats, those with definitely absent buboes amounting to 10.94 *per cent.* of the total.

In the cases where buboes were present, the situation was in the cervical region in 394, the bubo was single in 264, was bilateral in ninety-eight, and was in association with a bubo or buboes in other situations in thirty-two cases.

Axillary buboes numbered seventy-seven; they were single in forty-eight, bilateral in one, and in association with buboes in other sites in twenty-eight cases. The bubo was situated in the groin region in 115 cases, was single in twenty-one, bilateral in three, and in association with buboes in other situations in ninety-one cases.

Pelvic buboes were observed in 114 cases. They were single in twenty-five, bilateral in two, and in association with buboes in other areas in eighty-seven cases. In eighty cases the pelvic buboes were associated with groin buboes.

Retroperitoneal buboes, that is, buboes higher up than those called pelvic, were noted in sixteen cases. They were single in only five cases and in association with buboes in other sites in eleven cases.

The bubo was mesenteric in three cases, single in all.

It may be inferred that the infection was conveyed through the skin by inoculation from an infected flea in all the cases under discussion, excepting possibly in the three cases in which the bubo was mesenteric. In these three cases it is possible that the mode of infection was alimentary, through eating infective material, that material being most probably a rat dead of plague.

The large number of pelvic buboes is interesting, indicating that the bacilli were able to pass through the groin gland barriers. In the case of the retroperitoneal buboes, both the groin and the pelvic gland barriers were passed, and it becomes easier then to comprehend the seventy-four cases in which no buboes were present, that is, the intermediate gland barriers were passed and access gained directly to the blood stream. The very large proportion of cervical buboes to buboes in other situations suggests that, as has been shown by the Indian Plague Commission, fleas are more numerous in the fur of the neck than in other parts of the body, and it is likely that most of the septicæmic cases were bitten in this area, the infective bacilli having few gland barriers to pass and thus gaining rapid entrance to the blood stream. Abscess-formation had occurred in the bubo in five cases, in all of which the bubo was cervical.

In two of these, *B. pestis* were fairly numerous in the stained smear, but in only one were they present also in smears from the liver and spleen. In three, no *B. pestis* were seen in the abscess smears or in the organ smears. Guinea-pigs were inoculated with material from each of these three apparently negative cases and the experimental animals succumbed a few days later to plague, with typical signs.

Table 2 gives the data in monthly columns.

Enlarged glands in non-plague cases.—These were fairly common, particularly in the brown rat, which appeared to be the most liable to skin diseases, wounds, ulcerated areas and maggots under the skin. In the earlier part of the year they appeared to be more common than later. Smears were examined from each, and in most cases cultures were also made and guinea-pigs directly inoculated. The total number of enlarged glands encountered, not due to plague, was 113, cervical sixty-two, axillary twenty, groin twenty-eight and pelvic three.

TABLE II.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Cervical	16	12	20	12	4	2	7	21	57	109	67	32	359
Axillary	3	3	3	2	...	...	2	5	10	14	6	1	49
Groin	9	2	...	...	...	...	...	...	1	6	3	3	24
Pelvic	...	2	2	2	1	..	...	2	1	8	5	4	27
Retroperitoneal	3	1	...	...	...	...	...	...	1	...	...	...	5
Mesenteric	...	...	...	...	...	...	...	...	...	...	1	2	3
Groin and Pelvic	...	4	5	3	2	...	...	5	12	14	7	3	55
Cervical and Groin...	1	1	...	...	...	...	...	1	...	...	1	1	5
Axillary and Groin...	...	...	...	...	...	...	...	1	3	1	1	...	6
Cervical, Groin and Pelvic	...	...	1	2	1	...	...	1	1	4	2	...	12
Cervical and Retroperitoneal	...	...	...	...	...	...	...	1	...	1	...	...	1
Pelvic and Retroperitoneal	...	...	...	...	...	...	...	...	...	...	1	1	3
Cervical and Axillary	...	...	...	...	1	...	1	...	2	3	2	1	10
Axillary, Groin and Pelvic	...	...	...	...	...	1	1	...	1	1	3	1	8
Cervical and Retroperitoneal	...	...	...	...	...	...	...	1	...	...	1	...	2
Cervical and Pelvic	...	1	...	...	...	...	...	...	...	1	...	...	2
Axillary and Pelvic	...	...	...	...	...	...	...	...	...	1	1	...	2
Axillary and Retroperitoneal	...	...	...	...	...	...	...	...	...	1	...	...	1
Groin, Pelvic and Retroperitoneal	...	...	...	...	...	...	...	...	1	2	...	...	3
Axillary and Retroperitoneal	...	...	...	...	...	...	...	...	...	...	1	...	1
Total with Bubo...	32	26	31	21	9	3	11	38	90	166	102	49	578
Total with no Bubo	28	6	6	12	...	...	1	3	6	15	13	8	98
Total ...	60	32	37	33	9	3	12	41	96	181	115	57	676

Abscesses in non-plague cases.—These were met with in the lymph-glands, the spleen, the liver and the lung. In the present group of cases they were all examined in smear preparations, in culture, and by animal inoculation, the results being negative as regards plague in all. The abscess was in the cervical region in eleven, in the axilla in four, in the groin and in the mesentery in two cases each, and in the pelvic region in one case.

Single abscesses were met with in the spleen in thirteen cases, in the lung twice and in the liver once. Multiple abscesses of the spleen occurred in five cases, and they were observed in the liver in ten cases.

Naked-eye appearance of organs in Plague Cases: Liver.—This organ was most commonly “mottled,” sometimes finely, sometimes coarsely. The latter is an earlier stage of the next commonest condition, which was “speckled.” The speckling is due to innumerable minute areas of necrosis. Congestion, the earliest manifestation, was met with least commonly. The actual figures are shown in Table III.

TABLE III.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Mottled ...	21	11	22	15	7	1	2	21	27	28	47	17	219
Speckled ...	16	8	3	3	—	2	8	10	30	59	19	16	174
Congested	2	1	1	2	—	—	—	3	4	5	3	1	22
Normal ...	6	6	3	7	1	—	1	2	18	29	13	6	92
Putrid ...	15	6	8	6	1	—	1	5	17	60	33	17	169
Total ...	60	32	37	33	9	3	12	41	96	181	115	57	676

The *Spleen*.—This organ practically always showed congestion and enlargement. A speckled appearance was noted in only eight cases and a mottled appearance in one.

The *Suprarenals* shared in the general congestion. *B. pestis* were not found more frequently or in greater numbers in them than in other organs.

The *Lungs* frequently showed congestion but no consolidation either lobar or lobular.

Other conditions met with.—Pleural effusion was very common. It was noted in 492 cases. Usually the fluid was clear, but in twenty-six cases it was hæmorrhagic.

Subcutaneous hæmorrhages.—These were met with in the flanks, the axillary and the cervical regions. They were noted in the flanks in thirty cases, in the cervical region in twenty-four and in the axilla in five cases.

Intestinal Hæmorrhage.—This was observed in ninety-one cases. Sometimes practically the whole length of the intestine contained reddish black material, but mostly only a few inches of the bowel were involved. In eleven cases no buboes were present, in one case a mesenteric bubo was noted and in sixty cases the bubo was in the cervical region.

Evidence of chronic plague.—Five cases possibly belong to the category of chronic plague. They all occurred, in the latter half of the year, when the number of plague cases was increasing.

Case 1.—July—*R. norvegicus*. Cervical abscess present. Organs appeared healthy. No *B. pestis* in smears from abscess or from organs. Three guinea-pigs inoculated, all of which died within seven days with all the signs of typical plague.

Case 2.—September—*R. norvegicus*. Cervical abscess present, nothing else noteworthy. Smears from abscess and from internal organs negative. Guinea-pig inoculated on a scarified area of abdomen, with pus from abscess. Guinea-pig died eight days later with all the typical signs of plague.

Case 3.—September—*R. rattus*. Cervical abscess present. Nothing else noteworthy. Smears from abscess and from internal organs negative. Guinea-pig inoculated as above, died six days later with all the typical signs of plague.

Case 4.—November—*R. rattus*. Cervical gland on both sides of neck, yellowish, soft, not congested, adherent. Involution forms of *B. pestis* in pus from gland. Smears from organs negative. Liver faintly mottled, spleen slightly enlarged. No pleural effusion. Animal well-nourished and pregnant.

Case 5.—December—*R. rattus*. Pelvic gland on both sides enlarged, liver and spleen speckled, pleural effusion present, no general congestion. Smears from glands and internal organs negative. Gland juice injected into Guinea-pig, which died six days later with all the typical signs of plague.

In this connection, it must be added that, as already noted, enlarged glands to the number of 113, glandular abscesses to the number of twenty, and abscesses in the liver, the spleen and the lungs to the number of thirty-one were all examined, not only microscopically, but also culturally and by animal inoculation, with negative results.

Evidence of healed plague.—Some of the cases with enlarged but negative glands may have been examples of recovery from plague, but this is not capable of proof. Scars and adhesions of the spleen, thirty-nine cases of which were met with, may also have been signs of recovery from plague, but are equally incapable of proof.

Occurrence of R. rattus var. frugivorus and R. rattus var. alexandrinus.—Very many of the black rats showed signs of mixed breeding, but in a three-monthly period, when 14,623 *Rattus rattus* were examined, 332 were definitely *frugivorus* and 165 were *alexandrinus*.

Age of infected rats. It was only rarely that a young infected rat was found. There were four which measured three and half inches from snout to root of tail, and four were four inches long. All the others were adults.

Ectoparasites of the Lagos Rodents.—Ectoparasites were collected from the dead rats at Ereko by sieving the liquid disinfectant in which they were brought, washing the retained matter into a white basin and picking out the insects.

The number thus obtained gives no indication of the number of fleas, etc., per rat. The fleas obtained were *Xenopsylla cheopis* and *Xenopsylla brasiliensis* mostly, and on rare occasions *Ctenocephalus canis*. Male *X. cheopis* (2,096) out-numbered female *X. cheopis* (1,615), both of these outnumbered both sexes of *X. brasiliensis*; and the male *X. brasiliensis* (973) outnumbered the female *X. brasiliensis* (690). The other ectoparasites were *Laelaps echidninus* and *Hæmatopinus* sp. Table IV. shows the monthly figures.

TABLE IV.

		Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
X. cheopis ♂ ...	...	65	80	100	168	273	283	231	210	205	196	146	139	2,096
♀ ...	...	56	58	64	128	181	253	204	188	161	118	104	100	1,615
X. brasiliensis ♂	...	17	43	41	99	161	112	98	84	57	70	95	96	973
♀	...	17	21	27	64	88	72	64	83	54	59	52	89	690
C. canis ♂ ...	...	...	1	...	.	...	2	...	...	...	...	...	...	3
♀ ...	...	...	...	...	...	...	...	...	3	3	...	...	...	6
Laelaps ...	...	34	50	25	13	27	77	16	28	18	6	4	4	302
Hæmatopinus ...	...	...	...	...	...	...	...	...	1	...	...	...	...	1
Total ...	...	189	253	257	472	730	799	613	597	498	449	401	428	5,686

Ectoparasites were also obtained from live rodents, 804 black rats, fifty-one brown rats, and twelve " swamps " rats. The monthly numbers are rather small on which to base percentages for comparison and there was great variation in the number of fleas per rat. The figures are set out in Table V.

TABLE V.

FLEAS FROM LIVE *R. rattus*.

		Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Number of Rats	...	127	96	93	24	108	50	60	35	41	39	66	65	804
X. cheopis ♂ ...	...	63	103	79	38	36	61	63	32	61	86	63	50	735
♀ ...	...	75	79	70	22	28	37	34	23	34	34	35	39	510
X. brasiliensis ♂	...	52	34	56	15	15	20	10	43	49	22	46	19	381
♀	...	32	28	42	7	6	15	6	34	18	7	58	14	261
C. canis ♂ ...	...	1	...	...	...	...	...	...	...	...	...	...	...	1
♀ ...	...	1	1	...	...	...	1	...	...	...	...	...	...	3
Highest number per rat	...	6	30	15	16	4	9	8	9	19	14	14	7	...
Lowest .. ..	...	0	0	0	0	0	0	0	0	0	0	0	0	...
Average .. ..	...	1.76	2.55	2.65	3.41	0.78	2.68	1.88	3.77	3.95	3.82	3.06	1.87	2.35

Only fifty-one live *R. norvegicus* were received. They yielded *X. cheopis* 18♂♂, 28♀♀, *X. brasiliensis* 12♂♂, 9♀♀, and *C. canis* 4♀♀, a total of seventy-one fleas, averaging 1.39 per rat.

Twelve " swamps " rats were received. They yielded *X. cheopis* 7♂♂, 4♀♀ and *X. brasiliensis* 3♂♂, a total of fourteen fleas, averaging just over one per rat.

Seventeen shrews, *Crocidura manni* were received. They yielded one flea *X. cheopis* ♂.

Laelaps echidninus was found on the " swamps " rat as well as on the black and the brown rat. The black rats (804), supplied 247 *Laelaps*, the brown rats (51), supplied sixty-eight and the " swamp " rats (12), supplied 135 *Laelaps*. These insects were not found on any of the shrews.

Hæmatopinus sp.—The black rats yielded 105, the brown rats seventy-five and the " swamp " rats thirty.

ATTEMPTS TO TRANSMIT PLAGUE TO WILD RATS BY FEEDING.

Six experiments were carried out in an attempt to transmit plague to rats by feeding infective material to them.

- Experiment (1).* 15.2.27.—Five *R. rattus* in cage, fed with two crushed livers and two crushed spleens, mixed with bread and water. The two livers and two spleens both showed abundant plague-bacilli and were quite fresh. All the material was eaten within a few minutes as the rats had been kept without food for half-a-day in order to ensure that they were both hungry and thirsty. No rat showed any sign of illness after eating the infective material. They were all killed with chloroform ten days later (25.2.27). No signs of plague were found, there were no enlarged glands and all organs appeared healthy.
- Experiment (2).* 17.2.27.—One *R. rattus* fed on the liver and spleen of three infected rats, crushed and mixed with a small amount of bread and water. The three livers and three spleens were fresh and showed very numerous plague bacilli. All the material was eaten by the rat within a few hours. Eleven days later (28.2.27) the animal was killed with chloroform. On dissection, the organs appeared healthy, there were no enlarged glands, and no plague bacilli were found in smears.
- Experiment (3).* Two *R. rattus* fed on crushed liver and spleen from one infected rat, mixed with bread and water, on 18.2.27. Both liver and spleen showed numerous *B. pestis*. The rats were chloroformed on 28.2.27, the findings being entirely negative, as before.
- Experiment (4).* Two *R. rattus* on 24.2.27, fed on the hæmorrhagic intestinal contents of three infected rats, mixed with bread and water. The intestinal contents of all showed numerous plague bacilli. One experimental rat died three days later, but showed no sign of plague. The other was killed with chloroform on 8.3.27, and it also proved negative.
- Experiment (5).* 10.3.27.—Two *R. rattus* fed on crushed liver and spleen, mixed with the bloody intestinal contents of one infected rat. A little bread and water was added to the mixture. On the following day, 11.3.27, the crushed liver and spleen of a fresh infected rat was fed to them. On 14.3.27 one animal was found dead, but showed no signs of plague. The other animal died on 19.3.27, and it also was negative.
- Experiment (6).* 12.3.27.—Three *R. rattus* fed on hæmorrhagic intestinal contents of infected rat. On the following day they were given the crushed liver and spleen of a fresh infected rat, the infective material on both occasions being mixed with bread and water. On 18.3.27 one experimental rat was found dead, and the viscera of both abdomen and thorax had been eaten by the companions. A

small fragment of liver was found, however, and smears were made from it, no plague bacilli being found. On the following day, 19.3.27, both the remaining animals were found dead. There were no signs of plague at autopsy.

Thus, six feeding experiments on fifteen rats were entirely negative. It will have been observed that no control experiments were done. These were considered not necessary, as on all previous occasions, when infective rat material had been used on guinea-pigs, the results were invariably positive.

Intestinal hæmorrhage in plague rats.—In the Annual Report, 1926, pp. 11-14, certain observations and experiments were described. These were continued and extended during the first three months of 1927, and were communicated to the Royal Society of Tropical Medicine and Hygiene under the heading of “Intestinal Hæmorrhage in Rats Suffering from Septicæmic Plague considered as a Factor in the Spread of Human Pneumonic Plague.” This was reprinted in the transactions of that Society, Vol. XXI, No. 4, January, 1928, pp. 289-294. The paper was written in collaboration with Dr. J. C. Paisley, and it was considered that there is a definite danger of the transmission of pneumonic plague to human beings by means of the hæmorrhagic intestinal contents of plague rats.

The following experiments were carried out by Dr. B. G. T. Elmes, with the assistance of Dr. E. C. Smith. They were designed to ascertain whether plague bacilli obtained from infected rats in Lagos were capable of penetrating the unbroken skin of guinea-pigs, and if so, whether the channel of entry could be detected.

In all, three series of guinea-pigs were used. Owing to the rapid attenuation of the organism after having made several passages, new strains had to be made use of.

The method of applying the infectious material was as follows:—In an area of abdominal skin, about the size of half a crown, the hair was cut short with a scissors. The area was then examined with a hand-lens to make certain that no accidental abrasions had occurred. On this area, the plague infected material was applied by means of a cotton wool swab held in a forceps. From the tabulated results it will be seen that infection was obtained through the unbroken skin in six out of seven cases. The average time required for death to occur was 9.66 days, as compared with 5.8 days, which was the average obtained with nine infections through the scarified skin. It is worth noting the tendency to a pulmonary localisation of the condition in some of the animals infected *via* the unbroken skin (Nos. 22, 23, 25, 26, particularly No. 22). By a typical autopsy is meant that the animal showed the usual appearances of death from plague, *i.e.* :

- (1) General subcutaneous congestion.
- (2) Pleural effusion.
- (3) Speckled liver and spleen with marked enlargement and congestion of the latter organ.
- (4) Congestion of the suprarenals.
- (5) Buboes.
- (6) Pulmonary hæmorrhages.

Conclusions.

(1) That the strains of *B. pestis*, isolated in Lagos, can readily pass through the unbroken skin of guinea-pigs. The time required for the infection to become established is longer than when the plague-infected material is inoculated through the scarified skin.

(2) That from an examination of sections of the skin, taken at various intervals from the time of inoculation, it would seem that only a very small proportion of the inoculated plague bacilli penetrated the skin. This probably explains the longer time interval required in these cases.

Series A, B and C overleaf.

BLACKWATER FEVER.

Reports of thirty-five cases have been received, a number slightly higher than in recent years. For the purpose of recording cases of this disease there is a special schedule known as Combined Medical Form No. 18. The unwieldiness of the Form and the large amount of information asked for, tend to defeat the object, which is to obtain accurate data. No single schedule has been completely filled in, which is not surprising considering the amount of work involved, but is disappointing because in some cases the more important information is sacrificed to the lesser. The various data, as supplied, have been grouped and to some extent analysed under headings.

Sex.—An unusual feature is that there were four females, two of these being children.

Age.—All except three were adults, two being girls aged twelve and thirteen years respectively, and the third a male infant aged two and half years. This last case has been reported by Dr. C. Mackey in the West African Medical Journal, Volume I, No. 3, January, 1928, page 43.

The individual ages were: $2\frac{1}{2}$, 12, 13, 22, 24, 25 (four cases); 26 (four cases); 28, 29 (two cases); 31 (three cases); 32, 37 (three cases); 38 (three cases); 38, 45 (two cases); 46, 47, 48, 50 (two cases) and 60 years.

Between the ages of twenty-five and thirty-five years there were fifteen cases and there were nine cases between the ages of thirty-five and forty-five years. Below twenty-five years there were five cases and above forty-five there were six cases. Most of the European population in Nigeria are in the age period twenty-five to thirty-five years.

Occupation.—Non-officials numbered twenty-three, of which eight were engaged in trade, three were connected with the tin-mining industry, three were seafarers in local waters, two were attached to a Bank, two were married women, three were children, one was an engineer and one was a Moslem priest. Government officials were: Three Locomotive Drivers, three Political Officers, two Military, one Posts and Telegraphs, one Agriculture, one Railway Motor Engineer and one African Clerical Staff.

Race.—The descriptions given under this heading are: English sixteen, Scottish three, Irish three, Syrian two, Nigerian two, and Tasmanian, French, German, Swiss, West Indian, Gold Coaster, Sierra Leonean, Arab and Egyptian, one each.

Locality.—There were twenty cases in the Northern Provinces, fourteen in the Southern Provinces and one in British Cameroons. Kano provided nine cases, Lagos five, Jos four, Kaduna three, Agbor, Ibadan and Zaria two cases each, and Abeokuta, Egbe (Ilorin Province), Ikot-Ekpene, Ilorin, Opobo, Sapele, Victoria and Warri. one case each.

SERIES A.

G.P. No.	Mode of inoculation and material used.	Result.	Autopsy.	Remarks.
1.	Saline emulsion of a bubo from a plague rat rubbed into a scarified area of abdomen.	Died on 7th day.	Typical.	
2.	Spleen of No. 1 sliced open and rubbed into scarified area of abdomen.	Died on 6th day.	Typical.	
3.	Spleen of No. 2 rubbed on <i>unbroken</i> skin of abdomen.	Died on 9th day.	Speckled liver and spleen B. pestis in smears from organs.	Sections of skin from the inoculation area showed little change from normal. Blood vessels of corium packed with B. pestis.
4.	Spleen of No. 2 sliced and rubbed on scarified skin of abdomen.	Died on 6th day.	Typical.	This animal was inoculated same day as No. 3 and served as a control. It also demonstrated the shorter time necessary for infection <i>via</i> this mode of inoculation.
5.	Spleen of No. 4 rubbed on scarified area of abdomen.	Died on 6th day.	Typical.	Shows period required for infection to take place by this route to be fairly constant (<i>i.e.</i> 6 days) with this strain of B. pestis.
6. 7. and 8.	Spleen of No. 5 sliced and rubbed on the <i>unbroken</i> skin of abdomen of all three.	Nos. 6 and 7 killed at 24 and 48 hours intervals from time of inoculation respectively. No. 8 was allowed to live and never developed infection.	—	Sections of inoculated areas revealed plague bacilli on the surface only. As No. 8 never developed plague it would seem that the strain had become too attenuated to produce an infection through the unbroken skin.
9.	Spleen of No. 5 rubbed on scarified area of abdomen.	Died on 9th day.	Typical.	This G.P. was inoculated the same day as Nos. 6, 7 and 8 and therefore served as a control. Note the longer time required for the infection to become established.

SERIES B.

10.	Liver and spleen of a plague rat sliced and smeared on a scarified area of the abdomen.	Died on the 4th day.	Typical.	
11. 12. 13. 14. and 15.	Spleen of No. 10, sliced and rubbed into the <i>unbroken</i> skin of the abdomen.	Nos. 11, 12, 13, and 14 killed at 6, 12, 18, and 24 hours respectively from time of inoculation. No. 15 died on the 9th day.	— Typical.	Skin sections all negative except for occasional plague bacilli on the surface. No. 15 served as a control and showed that this strain was capable of producing infection through the unbroken skin.

SERIES C.

G.P. No.	Mode of inoculation and material used.	Result.	Autopsy.	Remarks.
16.	Liver of plague rat sliced and rubbed on scarified area of abdomen.	Died on the 6th day.	Typical.	
17.	Spleen of No. 16 sliced and rubbed on scarified area of abdomen.	Died on the 4th day.	Typical.	
18. 19. 20. 21. and 22.	Spleen of No. 16 sliced and rubbed on the <i>unbroken</i> skin of abdomen in all.	Nos. 18-21 were killed in 8, 15, 24 and 36 hours respectively from inoculation No. 22 was left and died on the 10th day.	— Liver and spleen negative. Infarct-like areas in the lungs which showed numerous <i>B. pestis</i> in smears.	Skin sections all negative except for scanty <i>B. pestis</i> on the surface. The lung involvement was the striking feature of autopsy.
23.	Liver, lungs and spleen of No. 22 emulsified in distilled water and rubbed into the <i>unbroken</i> skin of abdomen.	Died on the 10th day.	Typical and conspicuous hæmorrhagic areas in the lungs.	
24.	Same material used as in No. 23 smeared on scarified area of abdomen.	Died on the 5th day.	Typical.	Nos. 23 and 24 being inoculated the same day and with the same material, demonstrate well the variation of the time interval dependent upon the method of inoculation.
25.	Liver and lung of No. 23 emulsified in distilled water and smeared on <i>unbroken</i> skin of abdomen.	Died on the 10th day.	Typical and marked hæmorrhagic splotches in the lungs.	Smears from lungs, liver and spleen showed many involution forms of <i>B. pestis</i> .
26.	Liver and lung of No. 25 emulsified in distilled water and smeared on <i>unbroken</i> skin of abdomen.	Died on the 10th day.	Typical changes in lungs as in No. 25.	Involution forms present but not so marked as in No. 25.

Season.—There was one case in January and there were four in February, two in March, nil in April, two in May, two in June, three in July, six in August, four in September, five in October, three in November and three in December.

Period of residence in district.—This information is of doubtful value in the following cases, for the attached reasons: Three seafaring patients, two of whom developed the attack in Lagos and one in Victoria, and all of whom spent most of their time either on the water or in other ports; three locomotive drivers, two of whom developed the attack in Kaduna and one in Ibadan, and all of whom daily or nightly passed through or stopped at different places; a Lieutenant whose stations had included Zaria, Ibadan, Lagos and Kaduna, whose illness occurred during a visit to Zaria after a twenty-days' period of manœuvres; a sergeant who had been stationed at Ibadan, Lagos and Agbor within seven months and who got his attack seventeen days after arrival in the last-named station; and a French trader with no permanent residence whose dealings were mainly in cattle, who arrived at Kano a few hours before he went down with an attack.

In the remaining cases, the period of more or less continuous residence in the place where the attack developed was: Two, many years; one, four years; one, three years; three, two years; two, eighteen months; one, fifteen months; one, fourteen months; four, one year; one, ten months; four, eight months; one, seven months; two, six months; one, four months; one, one month and one not noted.

Length of present tour.—By this is meant the period since last in a temperate climate. Excluding the non-Europeans, this period was: one, five years; one, four years; one, nineteen months; one eighteen months; one, sixteen months; one, fifteen months; two, thirteen months; one, eleven months; two, ten months; three, nine months; two, eight months; four, seven months; two, six months; one, four months; one, three months; one, one month; and one, not noted.

Previous residence in Tropics.—*Case 1.*—Syrian, age 38 years; 36 years in Lebanon, 2 years in Nigeria.

Case 2.—English, age 38 years; most of his life at sea, 3 years in Nigeria.

Case 3.—English, age 29 years; 6 years in India, Mesopotamia and China, three years in Nigeria.

Case 4.—Egyptian, age 45 years; 44 years in Egypt, 1 year in Nigeria.

Case 5.—Swiss, age 50 years; 12 years in China, 8 years in Senegal, 4 years in Nigeria.

Case 6.—Scottish, age 26 years; $2\frac{1}{2}$ years in Nigeria.

Case 7.—English, age 31 years; 8 years in Nigeria.

Case 8.—English, age 47 years; 4 years in Ceylon, 8 years in Nigeria.

Case 9.—Nigerian, age 60 years; lifetime in Nigeria.

Case 10.—English, age 26 years; $1\frac{1}{2}$ years in Nigeria.

Case 11.—English, age 37 years; 8 months in Nigeria, other tropical experience not stated.

Case 12.—Gold Coaster, age 46 years; 24 years in Gold Coast, 22 years in Nigeria.

Case 13.—Irish, age 45 years; 15 years in Nigeria.

Case 14.—English, age 32 years; 10 years in Egypt and Sudan, $1\frac{1}{2}$ years in Nigeria.

Case 15.—Scottish, age 38 years; 2 years in Near East, 3 years in Ceylon, $3\frac{1}{2}$ years in Nigeria.

Case 16.—Nigerian, age $2\frac{1}{2}$ years; lifetime in Nigeria.

Case 17.—Syrian, age 12 years; $10\frac{1}{2}$ years in Syria, $1\frac{1}{2}$ years in Nigeria.

Case 18.—West Indian, age 26 years; 20 years in West Indies, 6 years in Nigeria.

Case 19 —Sierra Leonean, age 25 years; 23 years in Sierra Leone, 2 in Nigeria.

Case 20.—English, age 39 years; 5 years in South America, 7 years in Nigeria.

Case 21.—English, age 25 years; 2 years in Nigeria.

Case 22.—German, age 24 years; 9 months in Cameroons.

Case 23.—Irish, age 31 years; 5 years in India, 7 years in Nigeria.

Case 24.—English, age 53 years; 17 years in Nigeria.

Case 25.—French, age 28 years; 5 years in French West Africa.

Case 26.—English, age 26 years; 10 months in Nigeria.

Case 27 —Arab, age 25 years; 22 years in Tripoli, 3 years in Nigeria.

Case 28.—Irish, age 37 years; 3 years in India, 7 years in Nigeria.

Case 29.—Scottish, age 29 years; 5 years in Sierra Leone, 1 year in Gold Coast, 1 year in Nigeria.

Case 30.—English, age 13 years; $5\frac{1}{2}$ years in India, 13 months in Nigeria.

Case 31.—English, age 48 years; 4 years in Ceylon, over 2 years in Nigeria.

Case 32.—English, age 25 years; 10 years in West Africa.

Case 33.—English, age 27 years; 5 years in French Congo, 10 months in Nigeria.

Case 34.—Tasmanian, age 37 years; 2 years in Egypt, 17 months in Nigeria.

Case 35.—English, age 31 years; no information given.

It is noteworthy that the only tropical experience in Case 11 was, probably, only eight months; in Case 22, only nine months; and in Case 26, only ten months.

Personal Prophylactic Measures.—The data regarding personal prophylactic measures against malaria are given for what they are worth. They form interesting reading even if they are not all reliable, and attaching the malarial history adds to the interest.

Case 1.—Syrian, age 38 years; a chronic malarial cachectic, has had two previous attacks of blackwater. Takes quinine irregularly.

Case 2.—English, age 38 years; admits to only two previous attacks of malaria. Had been seedy for last four months. Takes five grains quinine more or less daily.

Case 3.—English, age 29 years; had malaria in Mesopotamia in 1918, several attacks in India, 1922-24, one "bad" attack and several "slight goes" last tour in Nigeria, and three or four "slight goes" this present tour. Has been taking five grains quinine regularly each day for last five months.

Case 4.—Egyptian, age 45 years; a chronic malarial cachectic, had blackwater twenty years previously. Takes quinine irregularly.

Case 5.—Swiss, age 50 years; had an attack of blackwater two years previously, has had frequent attacks of malaria. Takes quinine irregularly.

Case 6.—Scottish, age 26 years; had his first attack of malaria three days before onset of present attack of blackwater, used a mosquito-curtain in bed, wore mosquito boots in evenings, had taken no quinine for eighteen days before his malarial attack.

Case 7.—English, age 31 years; has had malaria, uses a mosquito curtain in bed and takes five grains quinine daily, has had “ low fever ” for last few months.

Case 8.—English, age 47 years; six attacks of malaria noted on his Medical History Sheet during 1919-1923, and another attack in October, 1924. Reports having had no fever during last eight months, sleeps under a mosquito net, does not wear mosquito boots, takes quinine very irregularly.

Case 9.—Native of Lagos, age 60 years; found dead, diagnosed post-mortem. Stated to have had frequent attacks of “ cold fever ” for which he took “ native medicine,” no prophylactic measures against malaria.

Case 10.—English, age 26 years; no notes except “ no recent fever.”

Case 11.—English, age 37 years; stated to have had an attack of malaria five days previous to onset of blackwater, and to have taken five grains quinine daily.

Case 12.—Gold Coast native, age 46 years; had frequent attacks of malaria. Took quinine irregularly.

Case 13.—Irish, age 45 years; ten attacks of Malaria on Medical History Sheet, has had numerous other “ slight ” attacks, sleeps in a mosquito-proof cubicle, takes five grains quinine in tablet form daily and was suffering from malaria just before onset of blackwater.

Case 14.—English, age 32 years; has had repeated attacks of malaria. He states that he takes the usual precautions, and that he takes five grains quinine daily, both of which statements are doubted by his medical attendant.

Case 15.—Scottish, age 38 years; had severe “ malignant malaria ” in Salonika in 1916, several mild attacks in Ceylon, 1920-23, two attacks in his first tour, one in his second tour and none, up to the present, in this, his third tour, in Nigeria, uses a mosquito net, wears mosquito boots and takes five grains quinine in tablet form daily. Had blackwater one year ago.

Case 16.—Ibo (Nigerian), age $2\frac{1}{2}$ years; had attacks of “ fever ” from time to time and was given quinine only when he complained of “ feeling cold.”

Case 17.—Syrian, age 12 years; diagnosed post-mortem, no history obtained.

Case 18.—West Indian, age 26 years; has had malaria, and has had irregular “ bouts of fever ” from time to time. Took quinine irregularly.

Case 19.—Sierra Leonean, age 25 years; has had malaria “ off and on ” frequently, and is an irregular taker of quinine.

Case 20.—English, age 39 years; has had several attacks of malaria, uses a mosquito net, takes five grains quinine when he

remembers, and had a definite malarial attack one week previous to onset of present attack of blackwater.

Case 21.—English, age 25 years; states he has had no malaria and that he takes five grains quinine daily. The medical attendant considers these statements untrue.

Case 22.—German, age 24 years; frequent attacks of malaria during last few months, seldom more than a week free from the illness. Says he is a regular quinine taker.

Case 23.—Irish, age 31 years; has had malaria, and had slight attacks for some time previous to the onset of blackwater. Used a mosquito net and had taken quinine regularly until the last few weeks.

Case 24.—English, age 53 years; has had malaria, uses a mosquito net, has taken quinine irregularly during the last six months.

Case 25.—French, age 28 years; has had malaria several times, sometimes uses a mosquito net, does not take quinine.

Case 26.—English, age 26 years; had a definite attack of malaria four months previously, uses a mosquito net, wears mosquito boots, did not take quinine until the attack of malaria, thereafter took five grains Quinine Bisulphate twice weekly.

Case 27.—Arab, age 25 years; has had malaria “off and on,” took no prophylactic measures.

Case 28.—Irish, age 37 years; has had seven or eight attacks of malaria, one attack about one month ago, sleeps in a mosquito proof room and takes five grains quinine daily.

Case 29.—Scottish, age 29 years; three definite attacks of malaria, last one a fortnight ago, uses a mosquito net, wears mosquito boots and takes five grains quinine regularly at lunch time.

Case 30.—English, age 13 years; had malaria several times in India and fairly frequently during her year's stay in Nigeria. Used a mosquito net and is stated to have taken $2\frac{1}{2}$ grains quinine daily. This last statement is queried by the medical attendant.

Case 31.—English, age 48 years; has had several “small goes” of fever during last three months, uses a mosquito net and is quite regular in taking five grains quinine in tablet form daily.

Case 32.—English, age 25 years; has had repeated attacks of malaria, and took no prophylactic measures.

Case 33.—English, age 27 years; has had occasional attacks of fever, uses a mosquito net and is practically a non-taker of quinine.

Case 34.—Tasmanian, age 37 years; has had occasional “small attacks” of fever, never consulted Medical Officer, used a mosquito net and never missed taking five grains quinine hydrochloride in the morning.

Case 35.—English, age 31 years; no history.

In thirteen cases the patient stated that a prophylactic dose of quinine was taken regularly, which suggests that in their case, the drug failed to protect them from malaria. In four instances the medical attendant has reason to doubt the accuracy of the claim to regularity. It would appear also that although all thirteen cases were having malaria more or less frequently, no attempt was made to get rid of the disease by means of adequate doses of quinine.

RECENT QUININE AND ONSET OF ILLNESS.

Case 1.—Syrian, chronic malarial cachectic, fever on 9th January, 1927, saw Medical Officer on 11th January, 1927, subtertian malaria diagnosed microscopically and five grains quinine in liquid form prescribed twice daily. Took five grains in the morning and again at noon, rigor at 9 p.m., passed blackwater at 9.15 p.m. Total quinine ten grains in twelve hours, last dose five grains, interval 9-9 $\frac{1}{4}$ hours. Died on 13th January, 1927. Urine did not clear.

Case 2.—English, "seedy" for months previous to 19th February, 1927, on which date he took a five-grain tablet of quinine bisulphate at 9 a.m. At 1 p.m. on 20th February, 1927, he passed blackwater. He did not complain of a rigor. Total quinine in twenty-four hours, five grains, interval twenty-eight hours. Urine cleared in forty-eight hours.

Case 3.—English. Caught a typical "cold" on 16th February, 1927, took his usual five grains quinine daily in the evening until 23rd February, 1927, on which date he took 5 grains quinine hydrochloride at 9 a.m., 5 grains at 11 a.m. and ten grains at 5 p.m. At 2 a.m. on 24th February, 1927, he had a rigor, and at 6 a.m. he passed blackwater. Total quinine in eight hours, twenty grains, last dose ten grains interval nine to thirteen hours. Urine cleared in twenty-four hours. As soon as urine became clear and alkaline he was put on quinine, rapid recovery following.

Case 4.—Egyptian. Chronic malarial cachectic. Had rigor at 1 p.m. on 25th February, 1927, took twenty grains quinine in liquid form in one dose at 9 p.m., and at 6 a.m. on 26th February, 1927, passed blackwater. Total quinine twenty grains, interval nine hours. Urine cleared in twenty-four hours.

Case 5.—Swiss. Felt unwell and took a five-grain tablet of quinine at noon on 22nd February, 1927. Four days later, *i.e.*, on 26th February, 1927, at 5 p.m., he had a rigour, and at 10 p.m., he passed blackwater. Total quinine five grains, interval four days. Urine cleared in four days.

Case 6.—Scottish. Malarial attack on 6th March, 1927, took twenty grains quinine in tablet form on 7th March, 1927, and again on 8th March, 1927, whether in divided doses and actual hour, not stated. At 2 a.m. on 9th March, 1927, he had a rigor and at 8 a.m., he passed blackwater. Total quinine forty grains in two days, last day twenty grains, interval probably about twelve hours. Urine cleared in eight hours.

Case 7.—English. Fever commenced on 14th March, 1927, increased his daily five grains to ten grains quinine in tablet form and continued this dosage until 17th March, 1927, on which day, at noon, he passed blackwater. He had no definite rigor. Total quinine in four days forty grains, last dose ten grains at 8 a.m., interval four hours. The urine cleared in three days.

Case 8.—English. Had "fever" on 1st May, 1927, felt better on 2nd May, 1927, took a five-grain tablet of quinine hydrochloride at 7 a.m. on 3rd May, 1927, had a rigor at 6 p.m. and passed blackwater at 11 p.m. Total quinine 5 grains, interval eleven to sixteen hours. The urine was clear on 6th May, 1927, but on 12th May, 1927, the temperature rose and blackwater reappeared. On 13th May, 1927, the urine was clear. On 17th May, 1927, there was again a slight rise of temperature and two samples of urine on that day were reddish in colour. Liquid quinine was begun, then, in one grain doses daily, increased by one grain each day until five grains daily were being taken. The two relapses occurred when no quinine was being given, and there were no relapses after quinine treatment was given.

Case 9.—Reliable history unobtainable.

Case 10.—No history given.

Case 11.—English. Had a malarial attack on 19th June, 1927, took only his usual five grains quinine daily and finally called in the Medical Officer on 22nd June, 1927, who took him to hospital. On 23rd June, 1927, had five grains quinine in liquid form thrice daily, last dose at 8 p.m. At 2 a.m. on 24th June, 1927, he had a rigor and at 10 a.m. passed blackwater. Total quinine in five days, thirty-five grains, last day fifteen grains, last dose five grains, interval six to fourteen hours. The urine cleared in twenty-four hours, but as the temperature rose again on 27th June, 1927, quinine was administered on 28th June, 1927, and blackwater at once reappeared, to disappear finally on 30th June, 1927.

Case 12.—Gold Coast native. On 2nd July, 1927, took twenty grains quinine in two doses of ten grains, on account of fever. On 3rd July, 1927, took ten grains quinine bihydrochloride in tablet form at 6 p.m., had a rigor at 9 p.m. and at 6.30 a.m. on 4th July, 1927, passed blackwater. Total quinine thirty grains in two days, last dose ten grains, interval three to twelve-and-a-half hours. Urine cleared in thirty-six hours.

Case 13.—Irish. Remained in bed on 5th July, 1927, temperature 102°·4 F, took five five-grain doses of quinine, last dose at 6 p.m. had no rigor, but just before midnight he passed blackwater. Total quinine twenty-five grains in one day, last dose five grains, interval six hours. Urine cleared in forty-eight hours.

Case 14.—English. A malarial attack began on 1st July, 1927, for which he took five grains quinine twice daily until 4th July, 1927, when he increased the quinine to three five-grain doses daily. On 5th July, 1927, blackwater was passed, but as there had been no rigor, and he had passed water several times on that day without observing its colour, the time of onset cannot be accurately determined. Total quinine forty-five grains in four days. The urine cleared in thirty-six hours.

Case 15.—Scottish. Had fever on 8th August, 1927, and next day doubled his usual five-grain dose of quinine. On 10th August, 1927, after taking one five-grain dose of quinine he sent for the Medical Officer who admitted him to hospital, examined his blood microscopically and found malarial parasites. Notwithstanding this finding, quinine was withheld, pending rendering the urine alkaline. On 12th August, 1927, the urine being only faintly acid, five grains quinine hydrochloride were given in solution at 8 a.m., at 10.30 a.m., there was a rigor, and at 11.30 a.m. blackwater was passed. From onset of fever on 8th August, 1927, onwards, the total quinine was twenty-five grains in five days, no quinine given on 11th August, 1927, last dose five grains, interval two-and-a-half to three-and-a-half hours. Urine cleared in forty-eight hours.

Case 16.—Ibo (Nigerian) infant. Complained of "colic" on 17th August, 1927, was given four grains quinine at 1 p.m., at which hour there was a rigor. Blackwater was passed at 2 p.m. on 18th August, 1927, and eleven hours later the child died. A similar dose of quinine had been given without ill-effect on 10th August, 1927.

Cases 17 and 18.—Histories unobtainable.

Case 19.—Sierra Leone native. Had malarial attack on 28th August, 1927, took ten grains quinine in a single dose (bihydrochloride) and repeated the dose on 29th August, 1927. On 30th August, 1927, he took ten grains in liquid form at noon. Almost immediately he had a rigor and at 2 p.m. he passed blackwater. Total quinine thirty grains in three days, last dose ten grains, interval two hours. Urine cleared in twenty-four hours.

Case 20.—English. An attack of malaria began on 25th August, 1927, the Medical Officer was called in on 28th August, 1927, and on microscopic examination of the blood malaria parasites were found. He was then put on a quinine mixture (exact dosage not stated but probably five grains thrice or four times daily) and his temperature became normal. On the morning of 31st August, 1927, at 6 p.m., he had a severe rigor and at 10 p.m., he passed blackwater. The total amount of quinine is not stated but the last dose was five grains in solution at 5 p.m., so that the interval was one to five hours. The urine cleared during the next day (1st September, 1927), but darkened again after another rigor in the evening, finally clearing on 3rd September, 1927.

Case 21.—English. Felt unwell towards evening of 21st September, 1927, and on 22nd September, 1927, took five grains quinine in tablet form at 1 p.m. after a shivering fit, sent for medical officer who brought him into hospital. At 8 p.m. he passed blackwater. Total quinine five grains, interval seven hours. Urine cleared in forty-eight hours.

Case 22.—German. Had an attack of malaria on 22nd September, 1927, and took thirty grains of Quinine, whether in divided doses or not, is not stated, had a rigor a few hours later and when he passed urine next, it was black. Twelve hours later the urine was clear.

Case 23.—Irish. Felt out of sorts for ten days previous to 23rd September, 1927, on which date, at 10.30 a.m. he took ten grains quinine in tablet form. At 10.30 p.m. on 24th September, 1927, he passed blackwater, and half-an-hour later he had a rigor. Total quinine ten grains in one dose, interval thirty-six hours. Urine cleared in forty-eight hours.

Case 24.—English. Had fever on 24th September, 1927, and took three five-grain tablets quinine in one dose at 6 p.m. On 25th September, 1927, he took five grains twice in the day. On 26th September, 1927, he took five grains at 6 p.m., six hours later he had a rigor and at 6 a.m. on 27th September, 1927, he passed blackwater. Total quinine in three days thirty grains, last dose five grains on last day, interval six to twelve hours. Urine cleared in six hours.

Case 25.—French. Felt feverish on 5th October, 1927, and took fifteen grains quinine in cachet at 7 p.m.. He had had a rigor at 6 p.m. and passed blackwater at 8 p.m. Total quinine fifteen grains in one dose interval one hour. Urine began to clear next day, but darkened again after a rigor on 7th October, 1927 (no more quinine having been taken) and finally cleared on 8th October, 1927.

Case 26.—English. In indifferent health for some time. Took her usual twice-weekly dose of five grains quinine bisulphate at 8 p.m. on 12th October, 1927. At 10 a.m. on 13th October, 1927, there was a severe rigor, followed by vomiting and diarrhœa. The diarrhœa continued throughout the day, so that the character of the urine was not observed and it was only on 14th October, 1927, that she found she was passing blackwater. Total quinine five grains, interval fourteen hours. She died on 16th October, 1927, the urine having remained black, but much diminished in quantity.

Case 27.—Arab. Had malaria "off and on" for weeks. On 16th October, 1927, took a five-grain tablet quinine bihydrochloride in morning and again in evening at 6 o'clock. Next day he had a rigor at 3 p.m., and at 4 p.m. he passed blackwater. Total quinine ten grains, last dose five grains, interval twenty-one to twenty-two hours. Urine cleared in eighteen hours.

Case 28.—English. Admitted to hospital suffering from malaria on 29th October, 1927, and was put on five grains quinine thrice daily by the mouth. The last dose was taken at 9 a.m. on 1st November, 1927, and blackwater was passed at 10 a.m. There was no rigor. Total

quinine forty-five grains in four days, last dose five grains, interval one hour. Urine began to clear on morning of 2nd November, 1927, but darkened again in afternoon, a phenomenon which was repeated on each of the following two days, the urine finally clearing on the fifth day.

Case 29.—Scottish. Had malaise on 29th October, 1927. On that day and on each of the two following days he took five grains quinine hydrochloride in tablet form at noon and again in the evening. The last dose was taken at 6 p.m. on 31st October, 1927, and at 10 a.m. on 1st November, 1927, he passed blackwater. There was no rigor. Total quinine thirty grains in three days, last dose five grains, interval sixteen hours. Urine cleared in five days.

Case 30.—English. Said not to have had fever for some weeks. Took her usual daily two-and-a-half grains tablet quinine hydrochloride at 7 a.m. on 23rd November, 1927 (believed to have had no quinine for five days previously) and an hour later passed reddish water. There was no rigor and the condition was at first thought by the parents to be due to menstruation. Total quinine two-and-a-half grains, interval one hour. Urine gradually cleared but on 27th November, 1927 it darkened again, coincident with a rise in temperature. Quinine was given in one grain doses once a day from 28th November, 1927 onwards, the temperature subsided and the urine finally cleared on 29th November, 1927.

Case 31.—English. Felt fairly well on 27th November, 1927, but at 10 p.m., had a rigor and felt very ill; at 11 p.m. and again at midnight he took a five-grain tablet of quinine. Driving a train leaving Minna at 7 p.m. on that day (27th November, 1927), he arrived at Kaduna at 8 a.m. and took another five-grain tablet of quinine. He had passed water several times *en route*, but could not observe the colour. He passed water at 8.30 a.m. on 28th November, 1927, which was black, and shortly thereafter had another rigor. If the usual morning dose of quinine is included, the total quinine is twenty grains in twenty-four hours, last dose five grains, interval half-an-hour. Urine cleared on second day, darkened on third, cleared again on fourth, darkened once more on fifth and finally cleared on sixth day.

Case 32.—English. Had a malarial attack on 2nd December, 1927, subtertian rings being found on microscopic examination of the blood, and he was given a mixture containing five grains quinine per dose. He took two doses on that day, and two doses again on 3rd December, 1927. On 4th December, 1927 he was taken to hospital on account of severe vomiting during the previous night. A severe rigor occurred at noon on 4th December, 1927, but no urine was passed until 3 a.m. on 5th December, 1927, when only a small quantity was passed, the colour being black. Patient died on 8th December, 1927, having passed very little urine, which remained black. Total quinine twenty grains in two days, last dose five grains, interval perhaps eighteen hours.

Case 33.—English. Had a slight attack of fever on 4th December, 1927, but took no quinine (he had taken none for months). He had a slight rigor at noon on 4th December, 1927, but did not feel ill and remained at work. On 6th December, 1927, at 12.40 p.m., he passed blackwater. At 4 p.m. it was red, at 6.15 p.m. it was yellow, at 8.30 p.m. it was dark red and it remained so until death at noon on 7th December, 1927. Only small quantities of urine were passed.

Case 34.—Tasmanian. Had fever on 8th December, 1927, and took his usual five grains quinine hydrochloride in tablet form at 8.30 a.m. on that and on succeeding day. He had no rigor but at 4.30 p.m. on 9th December, 1927, he passed blackwater. Total quinine in two days ten grains, last dose five grains, interval eight hours. Towards night of 9th December, 1927, urine was clear; it darkened again in early morning of 10th December, 1927, by evening of that day it was again clear but it again darkened in early morning of 11th December, 1927.

From 12th December, 1927, until 14th December, 1927, the urine remained clear, becoming red at end of 14th December, 1927, clearing in early morning of 15th December, 1927, darkening and again clearing during that day, remaining clear till 18th December, 1927, when it darkened again, to become clear on 19th December, 1927. On 23rd December, 1927, there was one specimen passed at noon which was bright-red in colour. Thereafter he rapidly recovered. No quinine was given throughout the illness.

Case 35.—No history given.

It will be seen that in every case where a history of onset was available, the initial signs and symptoms of the illness were those of a malarial attack; indeed, in Cases 1, 11, 14, 15, 20, 28 and 32 malaria parasites were found on microscopic examination of the blood, previous to the appearance of blackwater. It is only natural to find that quinine was taken in every case except one, always on the patient's own initiative, and in some cases later increased, moderated or stopped by the Medical Officer. The dosage in no case was excessive, although it was rather high in Case 22, namely thirty grains in one dose.

However, if the rigor be regarded as the first indication that lysis of the red blood cells is taking place on a large scale, the blackwater itself being the later manifestation of the condition, then it is probable that in Cases 4, 16, 21, 25, 30 and 31 quinine was first administered after, and not before the damage was done. This would mean that, including Case 33 where no quinine was taken, there were seven cases in which quinine was neither an exciting nor a predisposing cause. Case 19 might be added to this list, making the total eight, as the taking of quinine and the onset of rigor almost coincided. There were, in addition, six cases in which the amount of quinine taken was small, and the interval, before the appearance of rigor or blackwater prolonged. These cases are:—

Case 2.—One five-grain dose taken, an interval of twenty-eight hours.

Case 5.—One five-grain dose taken, an interval of four days.

Case 8.—One five-grain dose taken, an interval of eleven to sixteen hours.

Case 23.—One ten-grain dose taken, an interval of thirty-six hours.

Case 26.—One five-grain dose taken, an interval of fourteen hours.

Case 27.—Two five-grain doses taken, an interval of twenty-one hours.

The following cases are of particular interest: Case 8. The urine had remained clear for four days after the first relapse, but following a rise of temperature it reddened again. Quinine, in small doses gradually increased, lowered the temperature and the urine cleared during its administration. Case 11—Two days after the urine had cleared, the temperature rose and on the third day quinine was given, the blackwater reappearing shortly thereafter.

Case 15.—Quinine withheld for two days during which period attempts were made to render the urinary output alkaline. At the end of the two days, the urine being only faintly acid, the administration of five grains quinine was followed two-and-a-half hours later by a rigor and another hour later by the passing of blackwater. Case 30.—A relapse, accompanied by a rise in temperature was treated with quinine, the temperature subsiding and the urine clearing under its administration. Case 34.—No quinine was given after the five-grain dose which preceded the onset of blackwater by eight hours, nevertheless, he had

numerous relapses in the ensuing fortnight. The cases cited above, in their different groups, indicate that although it is wise, in a chronic malarial subject to be cautious in administering quinine, it is not justifiable to incriminate an indispensable drug the proper use of which will, in most cases prevent that state of malarial saturation which precedes blackwater.

Examination of the Blood.—A microscopic examination of the blood was made in thirty-one cases. As already noted, subtertian rings were found in seven cases before the onset of hæmoglobinuria, all of which were negative on examination after the appearance of blackwater except in Case 1 in which pigmented mononuclears were present on the second day. Sixty-one examinations were done during the course of the illness. On the first day of hæmoglobinuria nineteen cases were examined, subtertian rings were found in four, pigmented mononuclears in three and twelve were negative. Sixteen cases were examined on the second day of hæmoglobinuria, there were subtertian rings in two, pigmented mononuclears in one, and thirteen were negative. On the third day eight cases were examined, there were subtertian rings in one, pigmented mononuclears in one, and six were negative. On the fourth day five cases were examined, subtertian rings were present in one, pigmented mononuclears were present in one, and three were negative. The figures are the same for the fifth day. On the sixth and seventh days the four cases examined on each day were negative. In the total of thirty-one cases therefore in which the blood was examined after the appearance of hæmoglobinuria, five cases showed subtertian rings and an additional three showed pigmented mononuclears. Including those which showed subtertian rings before the onset of hæmoglobinuria and subtracting one of these which afterwards showed pigmented mononuclears, fourteen cases were thus definitely proved to have malaria.

Details of the positive cases are :—

Case 1.—Subtertian rings on first day.

Case 5.—Subtertian rings on second and fourth days.

Case 13.—Subtertian rings on first day.

Case 16.—Subtertian rings on first day.

Case 19.—Pigmented mononuclears on first day.

Case 26.—Pigmented mononuclears on first day.

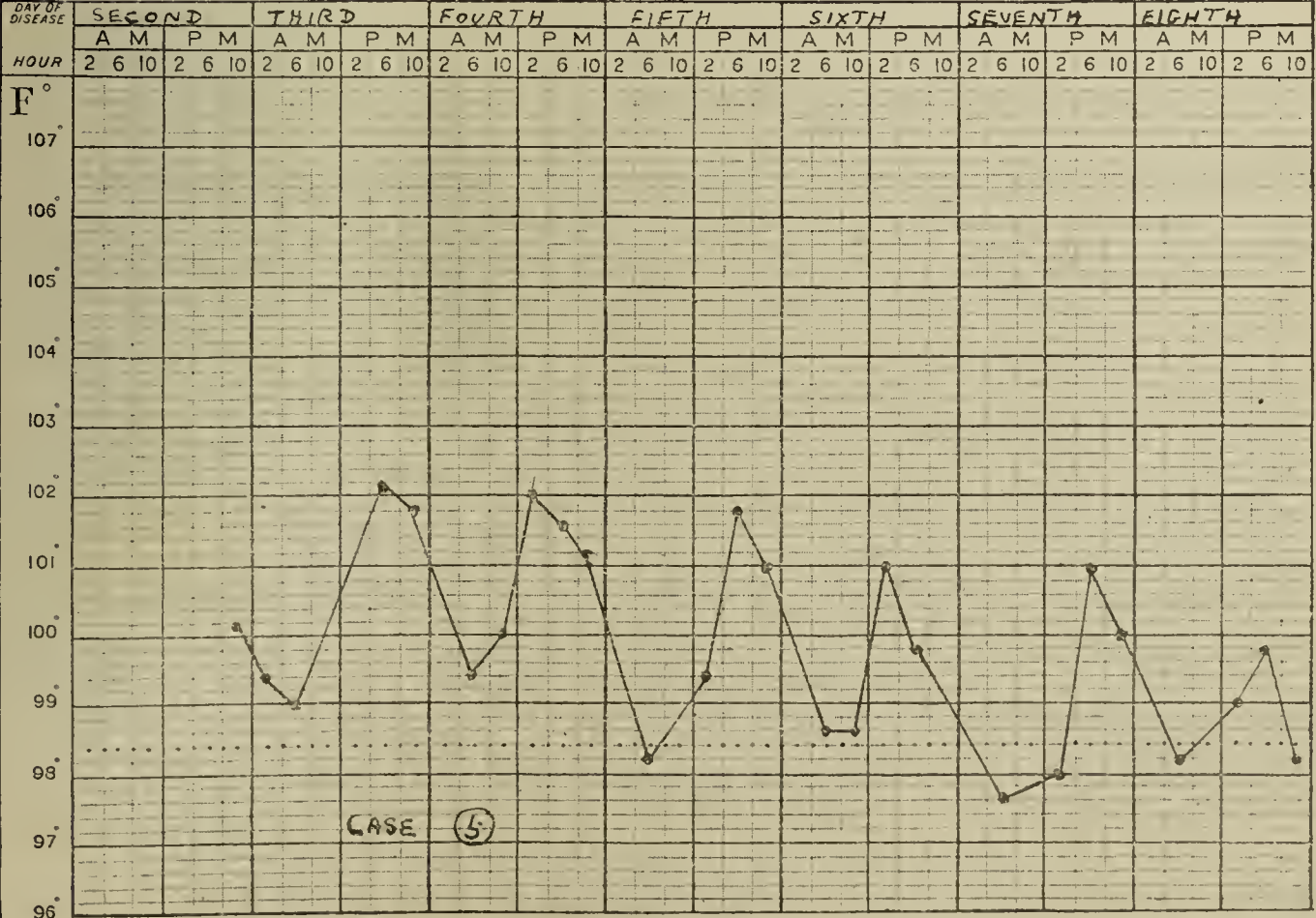
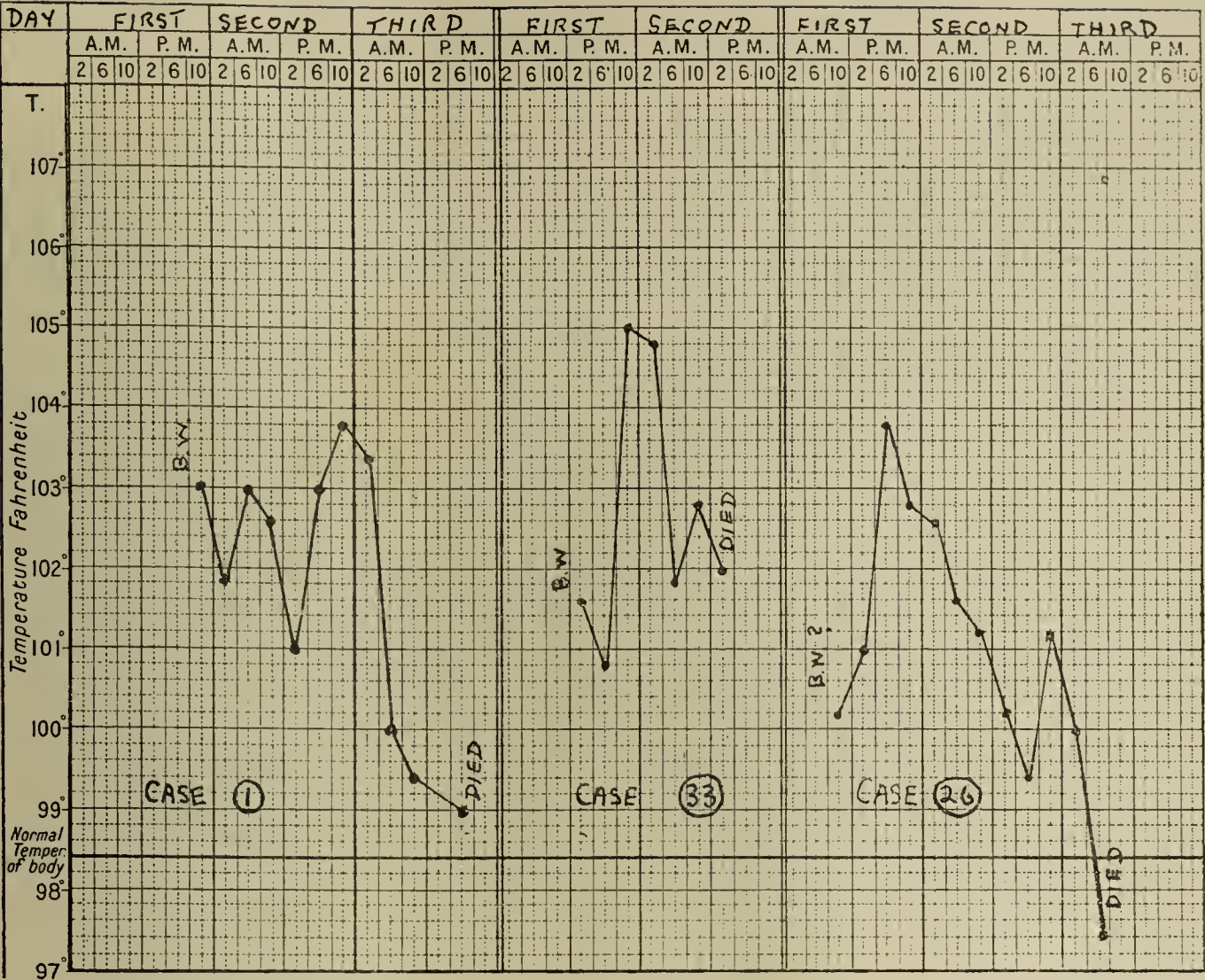
Case 34.—Pigmented mononuclears on first, second, third and fourth days.

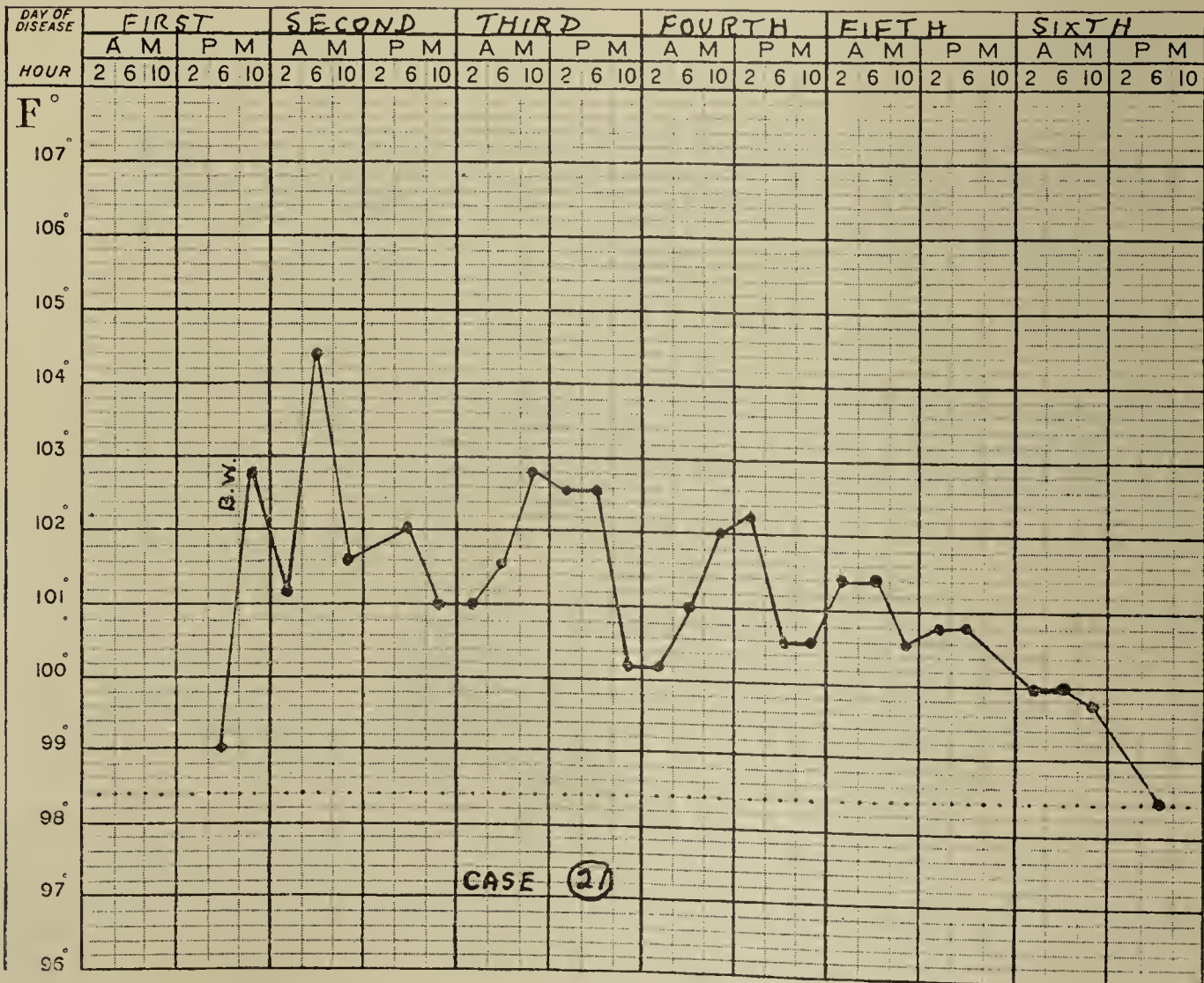
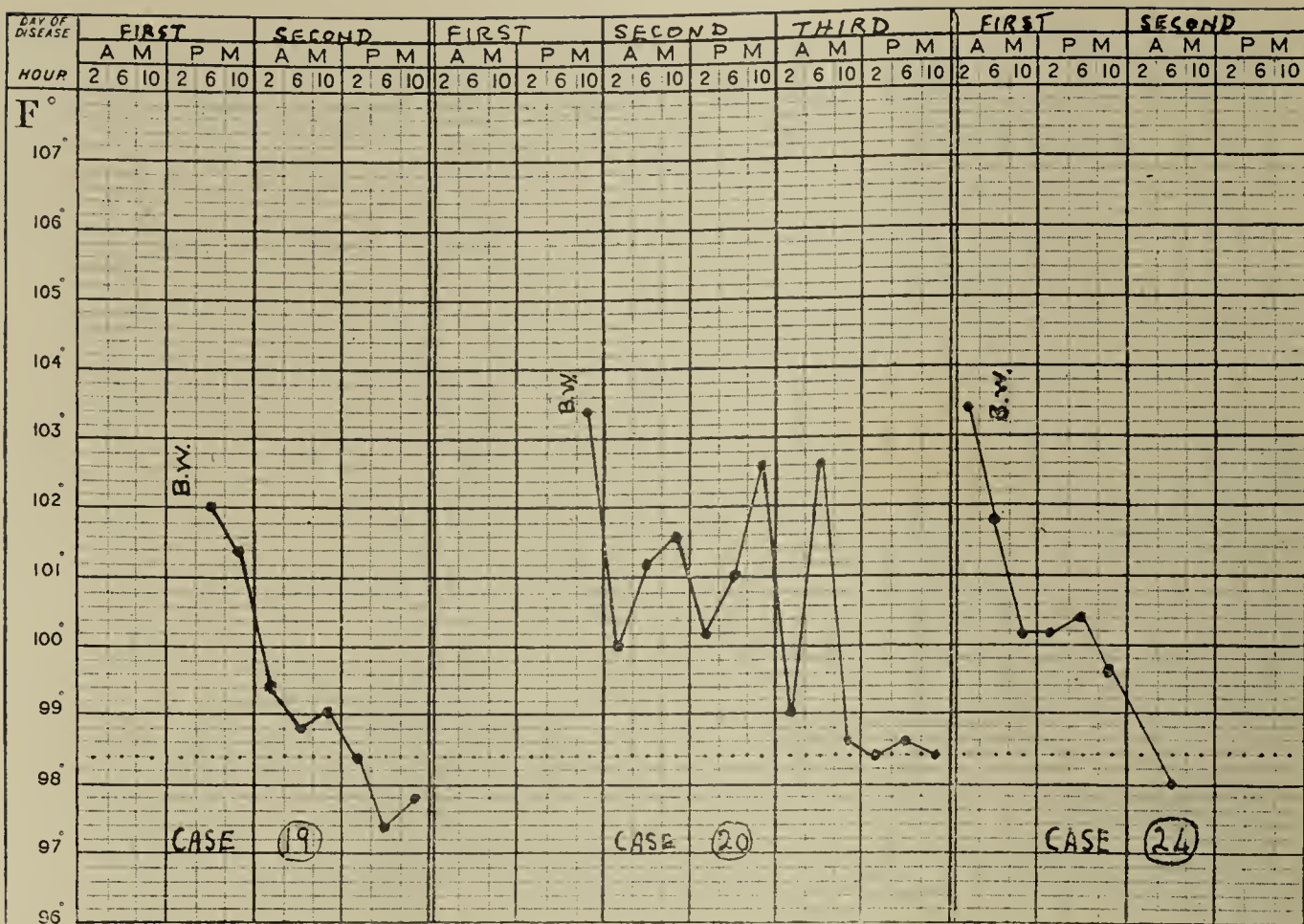
Case 35.—Subtertian rings on first and third days.

As regards the blood serum, in Case 2 cholæmia was observed on the second day, in Case 15 hæmoglobinæmia was noted on the first day, in Case 23 hæmoglobinæmia was observed on the first, second and third days, in Case 24 it was recorded on the third and fourth days and in Case 31 on the first day.

The clinical signs and symptoms require no description. Vomiting more or less severe, a certain anxiety, early jaundice and pyrexia were the outstanding features apart from the hæmoglobinuria. The occurrence of remissions and relapses has already been described in each case.

The illness had a fatal termination in eight cases. Two of these (Nos. 9 and 17) were first seen post-mortem. Cases 1, 2, 18 and 33 were rapid, particularly Cases 2 and 33, with ample excretion of urine. Suppression ensued in Cases 26 and 32. Temperature charts of some of the cases are appended.





DERMATOLOGY.

Dr. E. C. Smith reports as follows :

As investigations were only renewed in September, owing to leave of absence, the results are necessarily somewhat curtailed.

Two conditions of interest deserves special mention, namely, mycetoma and "creeping eruption." Illustrations of both are appended.

Mycetoma.—Though cases have occurred from time to time, which were classed under the heading of mycetoma or under madura-mycosis, they were for the most part incomplete, inasmuch as cultures were not obtained, thus rendering exact classification impossible. Fortunately, in two of the cases reported during the current year, cultures have been obtained.

In one case, occurring in a young native woman of Ibadan, where the condition was diagnosed by Dr. Naudi, the arm in the region of the elbow was involved. The area was markedly swollen and indurated, and numerous discharging sinuses were present. In the discharge, numerous bright red granules existed. Dr. Robertson, Acting Radiologist, Lagos, reported that no bone lesions were present.

The second case was much more instructive, inasmuch as it had passed muster for a chronic septic inflammation of the big toe, until finally its true nature was recognised by Dr. Cullen, who kindly sent the case for examination. In this instance, the metacarpal and carpal areas of the big toe were indurated and thickened, and several sinuses were noted. From these sinuses a discharge could be obtained on pressure, which contained scanty bright red granules similar to those in the previous case.

In both cases the neighbouring glands were slightly enlarged. The first case was treated therapeutically without any material benefit for some months, when she then vacated hospital.

The second case decamped after a sojourn of a few days in hospital. Fortunately, biopsies and material for culture had been obtained from both cases, thanks to the kindness of Dr. Ross (Surgical Specialist).

The red grains were washed repeatedly in saline and were inoculated on various media, positive results being obtained on Sabouraud's Glucose Agar, at room temperature (27°C) after an interval of about twenty days. The cultures appeared as heaped-up, raspberry or pyramid-like pink masses, showing irregular powdery areas. They were of a hard consistency, and fragments could be broken off with difficulty by means of a platinum loop. Examination of such a fragment in liquor potassæ (which rapidly decolourised the growth) showed it to be composed of fine mycelial masses, exhibiting beading in places. This mycelium was mainly Gram-positive. In broth, the formation of "puff-balls" was observed. Serum was clarified but not liquified by the growth.

The histological appearances corresponded to the text-book descriptions of such conditions, the grains lying surrounded by zones of inflammatory reaction. Fuchsin bodies were scanty. The grains were Gram-positive but not acid-fast. They appeared to be composed of a central mycelial portion with a peripheral fringe of minute coccoid bodies. A culture has been sent to the Lister Institute for identification purposes. Numerous animal inoculations were made, using both the grains themselves and emulsions of the cultures in saline. The results have so far been negative. It is hoped that Medical Officers will keep in mind the possibility of mycetomatous infections in cases that are not clinically characteristic.

In the Annual Report for 1926 (page 32) reference is made to another atypical case of mycetoma, but no culture was obtained from this case.

Myiasis.—A good illustration of this condition, which is but rarely seen in Lagos, is shown. The patient was a baby less than a year old and the condition had been present for about a month. Under a general anæsthetic, a circular area of skin about one and a half inches in diameter was removed by the Medical Officer in charge of the African Hospital. This piece of skin was cleared *en masse* in cedar-wood oil and the serpiginous track examined under a low power of the microscope. No parasite could be identified. One week later it was found that the condition had begun again at the site of the incision, truly a case of insult added to injury! The parasite tracked downwards for some days, and just when a fresh excision was in contemplation, the condition regressed and has since remained dormant.

Among other conditions noted were:

Moniliasis linguæ.—Thanks mainly to Dr. Savage, of the African Hospital, Lagos, numerous examples of this condition were seen. Typically, one finds the tongue spotted over with small white heaped-up areas. In some, fusion has occurred resulting in a thick coating which can be removed piecemeal with but little difficulty with a small curette. The removal of this false membrane leaves the surface of the tongue raw, but actual bleeding was not noted. The condition occurred in young infants. By repeated washing of minute pieces of the detached membrane in saline, and subsequent inoculation on Sabouraud's Glucose Agar, a prolific creamy growth was obtained within three to four days. Stained by Gram it was seen to be composed of Gram-positive, budding yeast-like bodies. Cultures on sugars produced acid and gas in Lævulose, Maltose and Glucose. Apparently the organism responsible for the condition is a monilia, probably *Monilia pinoyi*. Some of the larger portions of curettings were embedded in paraffin and sectioned, when a clear exposition of the relations of the fungus to other organisms was obtained.

Pseudo-leprosy.—During the year, numerous cases have arisen in which the clinical appearance is very similar to leprosy of the maculo-anæsthetic type. The patients were mainly young males and were enjoying good health. The clinical appearance, though varying according to duration, may be typified shortly as follows: The areas affected may be single or multiple and are usually asymmetrical. The colour is lighter than that of the surrounding skin, being of a characteristic brown-yellow tint. The areas have, for the most part, a serpiginous outline but ringed or plaque-like forms are also encountered. The edges are raised and infiltrated and frequently present a papular or follicular form. These papules when well-marked are flattened, with a smooth shiny surface and pitted centre. When the papules are of small size they suggest the appearance of sago grains lying subjacent to the epidermis. Scaliness is usually very slight. The condition is very chronic in nature and seems to progress with marked slowness. It is of paramount importance to distinguish the condition from true leprosy. To label such a condition leprotic means that the person affected is needlessly ostracised and has probably to undergo unnecessarily a prolonged course of treatment. In making such a distinction, two criteria were made use of, namely (1) the excision of a small portion under local Anestele for the purpose of microscopical examination, and (2) the pilocarpine test, readily performed by injecting intra or subcutaneously a few drops of a solution of pilocarpine nitrate in sterile water. A quarter-grain tablet dissolved in one cubic centimetre of water has been the strength adopted. By making an injection into the normal skin also, a useful control is obtained. If sweating occurs in both areas to approximately the same extent, it is strong evidence that the condition is non-leprotic. As regards the histology of the condition, it would seem that the primary lesion is a tubercle-like structure with well-defined giant cells. By subsequent fusion more extensive areas are formed which are localised mainly around the hair

follicles and sebaceous glands. Many of the hair follicles were heavily infected with bottle bacilli, others showing groups of gram-positive bacilli which were presumed to be acne organisms. Staining for acid-fast bacilli and for spirochætes was negative. To name the condition just described is a different problem, as syphilis, yaws, acne, lichen, and seborrhea have all been suggested. The important point to recognise is that there is a condition, very akin to leprosy in its clinical manifestations but essentially different in its ætiology. The following reasons for regarding the condition as not being leprotic might bear emphasis.

- (1) The prolonged history with scant progress of the lesions.
- (2) Absence of acid-fast organisms.
- (3) Absence of anhidrosis.
- (4) The histological appearances.

Tinea flava.—This condition, ubiquitous in Lagos, may cause some difficulty in diagnosis owing to its varied clinical appearances. In its more usual form it appears as pale areas situated on the face, neck, chest or arms. The areas may show considerable scaliness of a branny type, or may be smooth and entirely devoid of scales until scraped. The initial areas seem to be localised around the hair follicles. This perifollicular arrangement may be retained, the macules remaining separate so that a very typical mosaic-like formation results. More frequently the macules fuse and give rise to irregular map-like areas. Where the condition has been of long duration and has assumed a slowly progressive type, normal areas of skin darker in colour are inter-woven with the lighter-tinted abnormal portions to such an extent that it may be difficult to differentiate one from the other. Some of these cases may be confused with leprosy, but an examination of the scrapings will readily reveal the causative fungus.

The condition may prove very resistant to treatment, but the following prescription taken from Macleod's " Diseases of the Skin " has been found useful.

Acid salicylici ...	...	...	Grains, thirty.
Hydrargyri perchloridi	...	...	Grains, two.
Spiritus rectificatus	...	...	Drachms, two.
Aquam destil. ad.	...	...	Ounces, six.

Used as a lotion twice daily, if possible after bathing.

The causative fungus has long been recognised and has been named *Malassezia tropica* by Castellani. In sections the fungus can usually be found in abundance in the superficial layers of the horny epithelium and also, in many cases, it is seen to be present in the hair follicles at some considerable depth from the surface.

DERMAL MONILIASES AMONG NATIVES OF WEST AFRICA.

The out-patient department of the African Hospital, Lagos, provides a happy hunting-ground for those interested in dermatology. Mycotic affections are ubiquitous, those produced by the ringworm class predominating. It is only by close examination of such cases that many of them are found to be in reality the outcome of parasitisation with another type of mycosis, namely, *monilia*.

Castellani and Taylor (1925) and Castellani (1925) have drawn attention to the presence of *monilia* in certain cases of vulval, vaginal, and ano-perineal pruritus; they, however, doubt their pathogenicity and regard them as secondary invaders. Castellani (1912) alludes to a condition labelled " Intertrigo Saccharomycetica," apparently a rare condition which is met with in Ceylon and involves the scroto-crural and axillary regions—from scrapings of these areas a saccharomyces-like fungus *Saccharomyces samboni* (Castellani, 1907), is found and readily

cultured. From recent researches it is thought that the organism belongs to the genus *Monilia*. Again, Castellani and Chalmers (1921) describe blastomycetic conditions that yield a *monilia* on careful examination. These conditions all appear severe in type, being either ulcerative or granulomatous in nature. Kaufmann (1922) also alludes to vaginal pruritus brought about by *monilia*. Engman (1920) describes the case of a negress with a scaly inflammatory eruption of the vulva, and under both breasts, from which a fungus was obtained and classified as a *Monilia*. Adcock (1923) portrays a case of two years' duration in a European, occurring on the palm and interdigital clefts—eczematous in nature with small deep epidermal blisters, in the fluid of which he observed yeast-like cells.

The cases seen in Lagos are numerous, but it is intended to utilise only those which have been definitely proved to be the result of an infection with *monilia*. All the cases, apart from clinical examination, were investigated microscopically (*i.e.*, examination of scrapings from the lesion in caustic potash solution and in stained smears) and culturally.

Where permissible, a biopsy was always performed and a careful histological examination made. In a certain number of cases, the microscopical, cultural and histological examinations, all gave positive findings. In others, two criteria—microscopical and cultural, microscopical and histological, or cultural, and histological—were positive. No case was regarded as definite when a positive finding was only obtained microscopically or by culture. A positive histological examination was regarded as definite.

CLINICAL APPEARANCES.

The area most frequently involved was found to be the scrotum, the patient invariably giving a history of severe and persistent itching. In those very early cases, an examination of the part proved disappointing—nothing abnormal was visible beyond a faint whiteness and dryness of the scrotal integument from which minute fluffy or powdery scales were obtained by scraping. At a later stage, larger scales were present—sometimes hanging down in large flakes and producing an intense, almost cast-like, exfoliation. The desquamated areas had a pinkish hue as compared with the normal, darkly pigmented, surrounding skin. A demarcation line, slightly raised and composed of small, adherent, darkly pigmented scales, was occasionally present.

At still later stages the clinical picture underwent various metamorphoses, dependent upon the exertions of the owner of the scrotum in question. The application of that native panacea, palm oil, being particularly favoured, the resultant product was a revolting mixture of matted scales, dirt and exudate. Oedema and eczematous thickening of the skin—which takes on a shiny, ichthyotic appearance—accompanied by glandular swelling in the groin frequently occurred; sepsis often supervened, a condition brought about presumably by the continued scratching awarded to such areas.

In a few cases the scrotal skin presented a rough, sandpapery appearance, comparable to lilliputian pebble-dashing, the pebbles being formed of heaped-up epithelial cells, darkly pigmented.

The groin or crural region was but rarely involved in the process. In a few cases, where the condition had extended to the inguino-crural region, fungi of the ringworm type were recovered from the scrapings.

The condition, as it affects the remainder of the body, is again very variable in appearance. Psoriasis-like patches, scattered over the trunk and limbs, form one variety and may occur in connection with the scrotal involvement. In such circumstances it seems reasonable to conclude that these patches are the result of a mechanical spread from that region.

Such patches vary in size and shape; large irregular areas may ensue from confluence of smaller ones. They are usually very scaly and tend to become whiter when scraped.

A second clinical variety exists in which the areas involved are irregular, somewhat shiny, and like much creased silver paper with here and there scaly patches and tiny dark-coloured scabs. Peripherally, such areas may be definitely delineated by small, dark, tightly adherent scales, with occasionally a hint at papule or vesicle formation. The mammary region is a rather frequent site for this variety of lesion.

On the face, an impetiginous character may be imparted to lesions by the scab or crust-like covering which occurs. When scraped, the scabs are found to be formed of masses of dry scales.

Many of the lesions closely resemble the changes produced by the seborrhœa of temperate climes.

Very possibly *monilia* affections do not always remain so superficially located. Quite a few cases have been seen in whom the involved area—usually the limbs, and particularly the legs—showed a markedly eczematous type of lesion, the skin being very stiff and indurated like leather, scaly in patches and slightly moist. On pressure the areas were inclined to pit, and if this were sufficiently exerted beads of pus broke out between the scales. *Monilia*-like bodies could be demonstrated in the scales and the fungus could be obtained in culture therefrom. Repeated examinations of the pus proved negative as regards a mycosis, as also did sections of the parts involved.

Two cases of a somewhat different character deserve brief mention. Both were adult males, each with a chronic history of leg abscess. The lesions in the two cases were closely similar. The skin of the legs, on their anterior aspects, was indurated and in places definite scarring was noted. Here and there sinuses occurred which yielded a thick purulent discharge on pressure. From each of these cases a *monilia* was obtained in pure culture from the pus on one or two occasions only. Several small excised pieces, together with enlarged inguinal lymph glands, were examined for the presence of a fungus and were found to be negative. The cases just referred to had resisted various treatments prior to the isolation of the fungus. On being placed on potassium iodide medication they rapidly cleared up. In such cases as these, it is difficult to know how much of the condition can be ascribed to secondary sepsis and how much, if any, to the fungus. Lacking further proof it seems better to regard them with doubt.

From the foregoing description it will readily be seen that there are few, if any, characteristic features to be found in a clinical examination of a *monilia* infection. The various forms of ringworm are capable of producing exactly similar appearances. Consequently, if a differential diagnosis is to be made, other criteria must be used.

DIAGNOSIS.

Microscopical.—Scrapings from an involved area will frequently reveal whether the condition is due to a *monilia* or a *tinea*. In the former the yeast-like budding forms, when stained by Gram's method, are very characteristic, mycelium is usually scanty. In the latter, caustic potash preparations reveal, as a rule, well-marked mycelium, and the typical yeast-like budding forms are absent. Consequently, a positive microscopical examination can be regarded as reliable.

Cultural.—Sowing of the scales on Sabouraud's medium, subsequent to washing in saline or a few minutes in weak alcohol, is the method adopted.

If present, the *monilia* should appear from within four to seven days as an opaque white (or in some strains, pink) growth. On

examination in a drop of saline it is found to be composed almost entirely of yeast-like forms, though an occasional mycelial fragment may occur. A positive culture must never, in itself, be regarded as diagnostic, since these fungi may be present saprophytically. It should be confirmed by a positive microscopical or histological examination.

Histological.—Examination of sections usually allows of a certain diagnosis, and a ready differentiation from other fungal conditions, to be made. It is important that the sections pass through a hair follicle, since it frequently happens that this is the only site in which the *monilia* is found—a point equally applicable to other fungal types. On what grounds can the differential diagnosis be made? In the various forms of *tinea* met with, mycelial strands are of common occurrence. Where spore forms are present they tend to arrange themselves regularly—either in patterns or chains. Again, the hair itself is frequently invaded by the fungus.

With *monilia*, hyphæ are extremely scanty and, if present, are short and elementary in form (except in experimental lesions when a heavy infection is present). In no case has the fungus been demonstrated with certainty within the hairs.

The typical yeast-like character of the budding or sporulation is very striking in *monilia* affections and is shown to advantage in sections.

A point of interest is the fact that staining by the pyronin methyl green method shows considerable chromatic variation according to the variety of fungus present. The *monilia* fungus takes up the pyronin stain intensely and appears a bright red or crimson tint, the capsules showing but poorly. In the other fungal varieties, the hyphæ and spores assume a much more subdued tint—appearing as a rather pale pink or violet-pink shade—and the capsules are more distinct.

It is not unusual for the corium to show a considerable reaction to the follicular invasion and a barrier of inflammatory cells—polymorphs and lymphocytes, or in the later stages lymphocytes and young fibroblasts—is set up round the invaded areas, and may infiltrate considerably the surrounding tissues. Giant cells may be found, and, when such an inflammatory area happens to be cut in a section which is without a hair follicle, it may, if not sufficiently examined, simulate a lupoid condition.

Hyperkeratosis and parakeratosis are constant findings, and usually dominate the microscopical picture.

The stratum granulosum frequently appears unusually distinct. Various distortions in the adjacent malpighian cells, particularly œdema, would be expected, and are usually present. The epithelium of the affected follicles also shows degenerative changes.

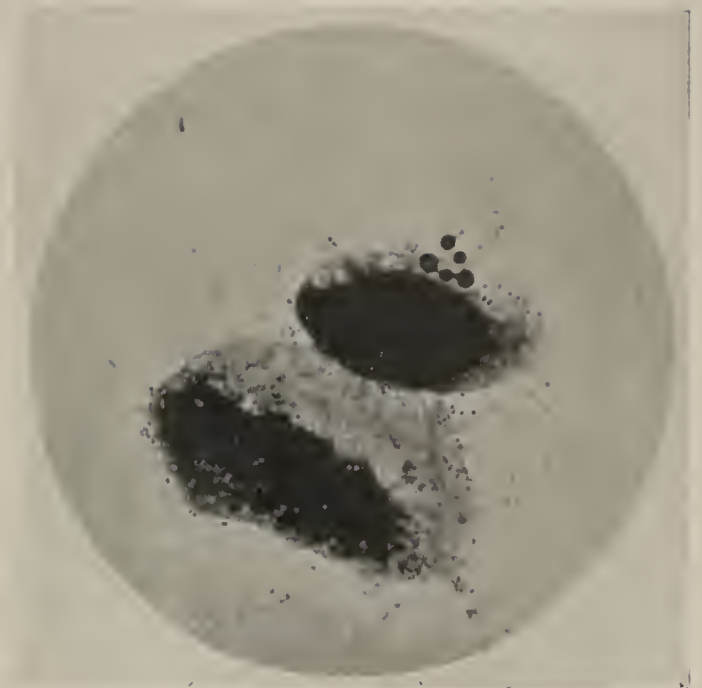
It is interesting to consider the possibility of these native-borne moniliasis as originating some of the “prickly heat” so rife among Europeans.

SUMMARY.

1. The class of fungus known as *monilia* is shown to occupy a real position among the many mycoses capable of producing a dermatitis in natives of West Africa.

2. The close clinical resemblance to the various forms of *tinea* infection, rendering in many instances a naked-eye differentiation difficult if not impossible, is stressed.

3. Various diagnostic criteria—microscopic, cultural and histological—are discussed. The cultural method used alone, is shown to be inconclusive. The histological findings are described in some detail since it is believed that they offer the most reliable means of diagnosis and differentiation.



× 790.

Scrapings from cheek showing good budding forms.

This patient came complaining of severe pain in the legs. Examination revealed that they were indurated and scaly on their anterior aspects, and beads of pus exuded on gentle squeezing.

Microscopical: Scales from the involved areas showed numerous yeast-like bodies.

Cultural: Repeated cultures were made of the pus. Staphylococci only were obtained.

Histological: The findings were those of a chronic inflammatory condition.

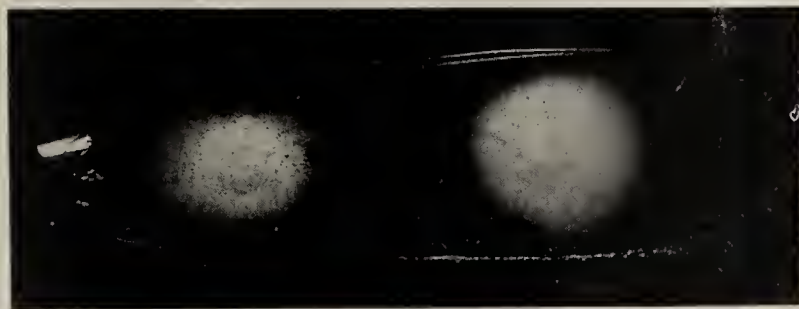
The condition cleared up completely under potassium iodide treatment.

Five months later the patient returned with a scaly, slightly papular patch on the cheek. The legs appeared to be quite normal.

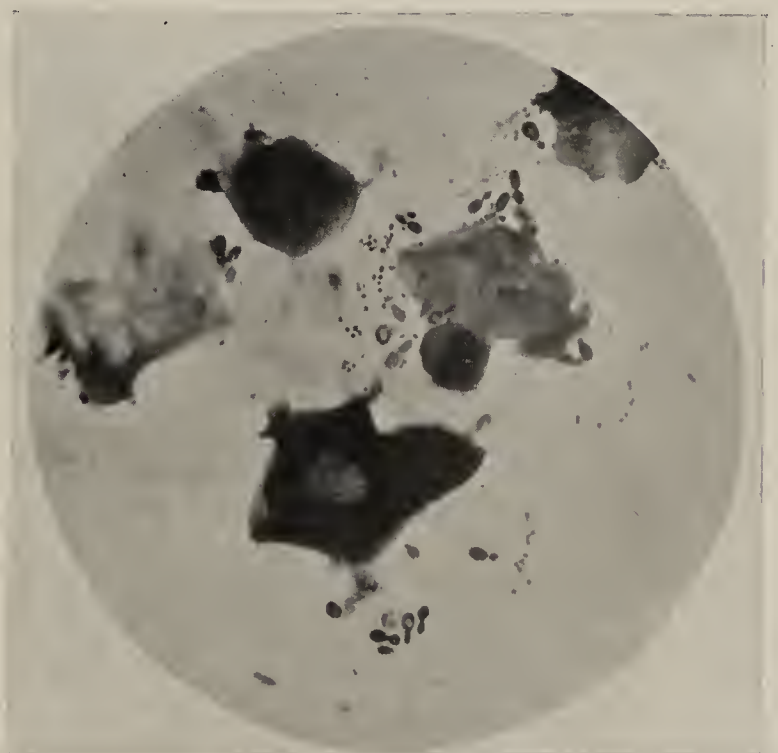
Microscopical: Typical fungal groups present in the scrapings from this area.

Cultural: Pure growth of a monilia obtained.

It seems possible that the condition of the patient's legs was a septic one which had become superimposed upon a dermal moniliasis.



Culture on Sabouraud's glucose agar from case depicted below.

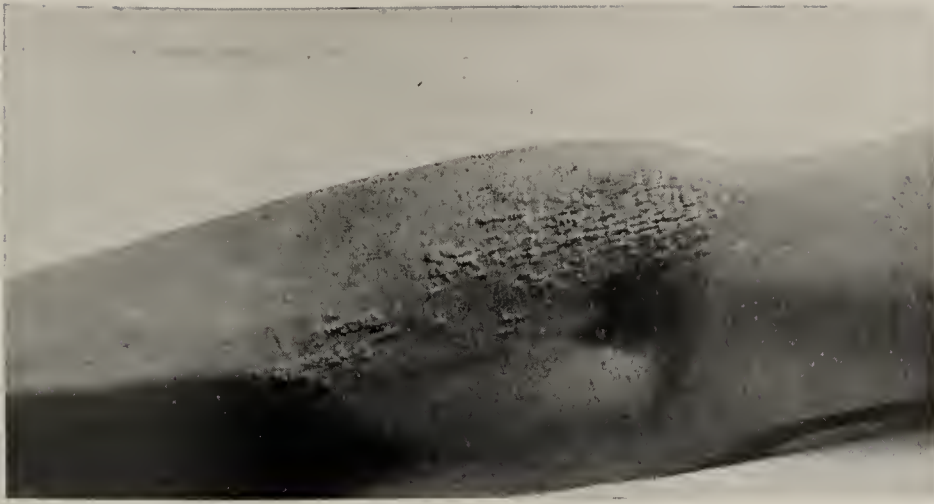


× 790.

A young girl, aet. 12. Duration one month. The lesion involves only the face where it appears as scaly patches with scab formation in places. The scales come away in large flakes and are very dry.

Microscopical: Numerous yeast-like bodies present, some arranged in groups. Scrapings stained by Gram.

Cultural: positive. The photo is that of twenty-one day growth on Sabouraud's glucose agar.

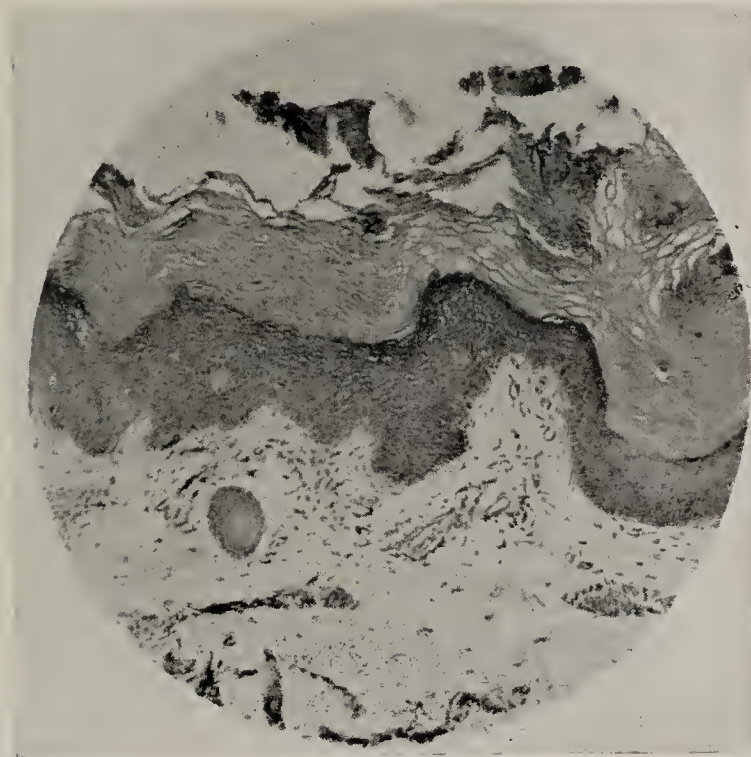


Male, aet. 22. Duration three months. The lesion involved the anterior aspect of the right elbow joint and the posterior part of the patient's neck. The condition presented a peculiar linear character as if numerous parallel scratches had been made with resulting hypertrophy and slight hyperpigmentation of the horny layer in these regions.

Microscopical: Numerous yeast-like bodies and spores present.

Cultural: Negative. Heavy secondary infection.

Histological: Marked hyper- and para-keratosis especially in the region of the hair follicles. Numerous fungal elements (monilia) present in the cells of the infected hair follicles and in the horny layer.



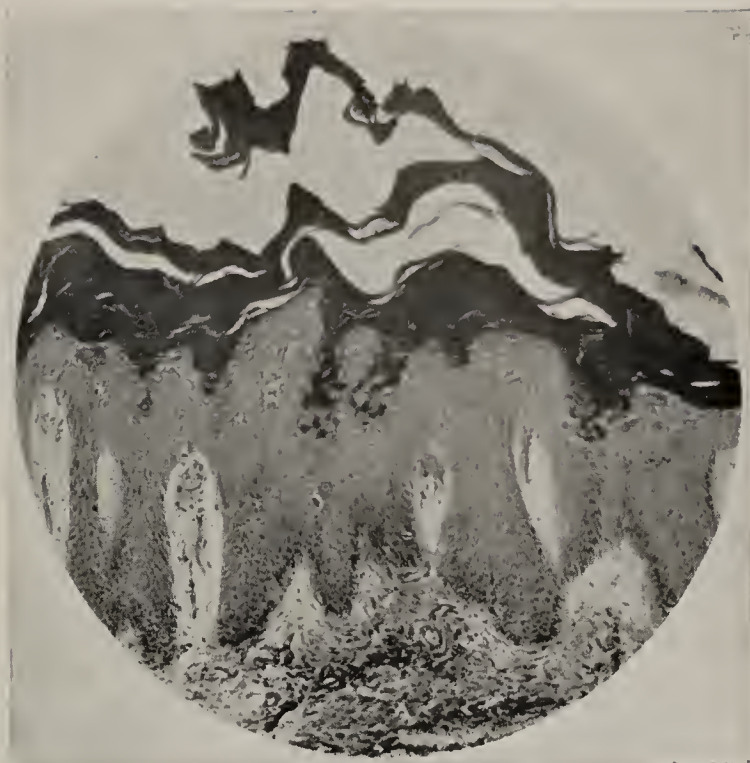
× 80.

Section showing the ridge-like thickening of the horny layer. The corium shows some infiltration.



× 790

Hair follicle showing monilia bodies.



× 80.

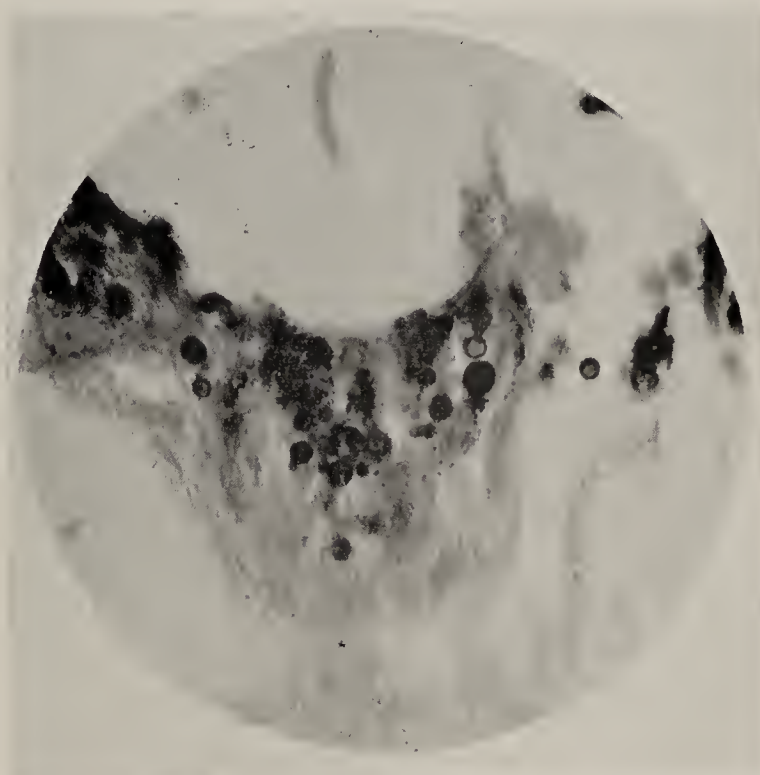
Section showing the hyper- and para-keratosis and acanthosis.

Male, aet. 21. Had a marked desquamatory condition of the scrotum, combined with numerous very scaly, almost psoriasis-like, patches on the body and legs.

Microscopical: Scales from buttock showed numerous monilia bodies.

Cultural: A red-coloured strain of monilia isolated.

Histological: Marked hyper- and para-keratosis with acanthosis of the malpighian layer. Irregular keratinisation giving the appearance of horny processes extending into the *rete malpighii*. Slight reaction in the corium. Fungal elements found after prolonged examination of the horny layer. Presumably the lesions on the body originated from the scrotal infection (also of the monilia type).



× 790

Section through portion of a hair follicle showing numerous monilia bodies.

Male, aet. 30. Duration of lesion four months. The lesion consisted of an irregular patch in the right scapular region. The central part showed hyperpigmentation and yielded delicate fluffy scales on scraping. Peripherally, the area was surrounded by a raised band-like border composed apparently of fused papules.

Microscopical: Negative.

Cultural: Negative.

Histological: A heavy infection of the hair follicles with the characteristic yeast-like bodies found.



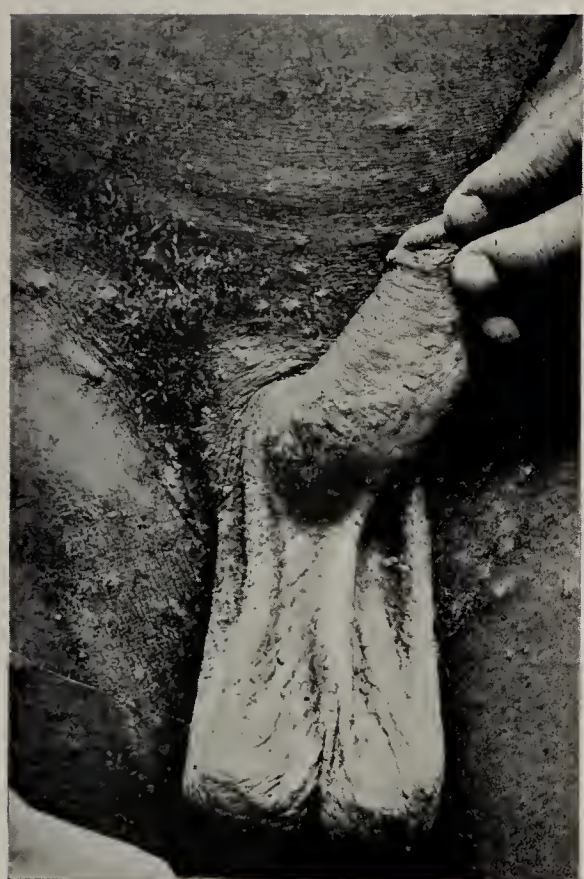
A.



B.



C.



D.



E.

Monilia dermatitis as it involves the scrotal region. A, B and C show, to a certain extent, the creased appearance of the skin and also, here and there, the little tags of separating epithelium. In D, the condition is seen to be extending up on to the ventral surface of the penis. The affected portion appears smooth and has a raised, slightly papular edge. In E, a faint demarcation line can be made out between the lower involved portion and the upper normal area, particularly on the right side.

MYIASIS.



Creeping Eruption in a child one year old. Two months' duration.

MYCETOMA.



Case of mycetoma sent by Dr. Cullen.



Case of mycetoma sent by Dr. Naudi.

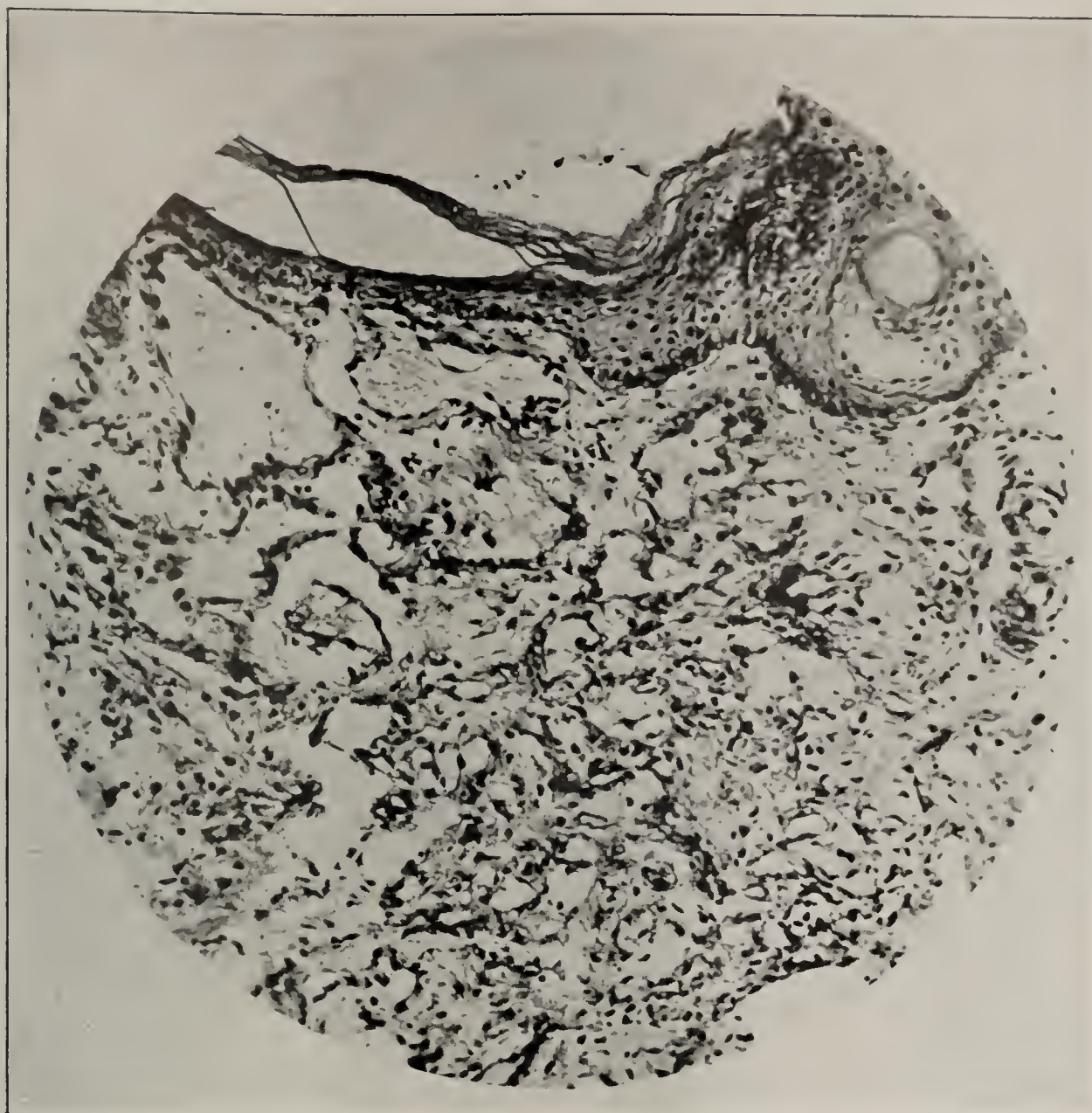


Fig. 1.

Congenital hæmangioma in a child aged 1½ years. The upper photograph shows the histological structure. Below is shown the actual lesion.



Fig. 2.

CASE OF ANGIOMA IN A CHILD.

MICROPHOTOGRAPHS ILLUSTRATING
THREE TYPES OF NEOPLASM
OCCURRING IN NATIVES.

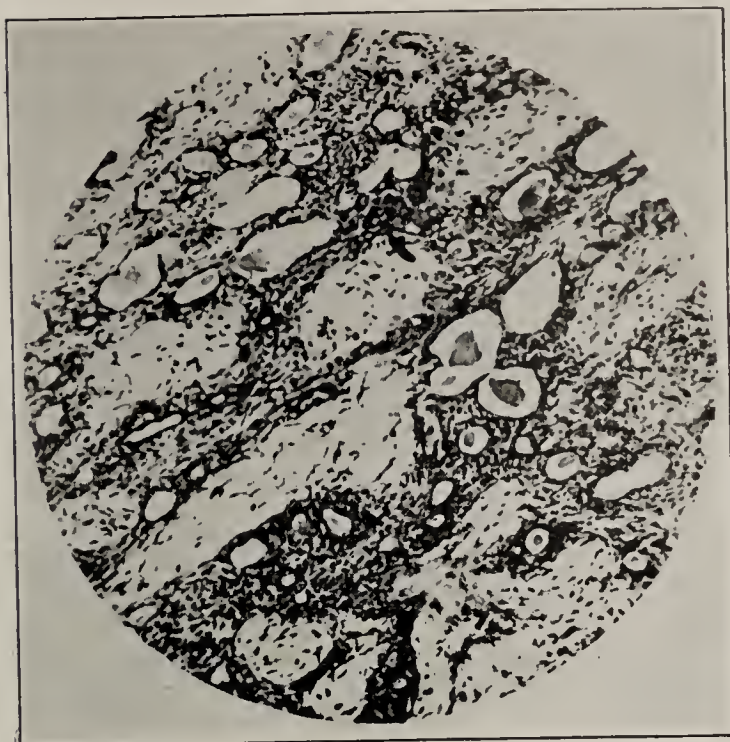


Fig 1.
Section of an endotheliomatous-like tumour.
Removed from the neck by Dr. Selby,
Ijebu-Ode.

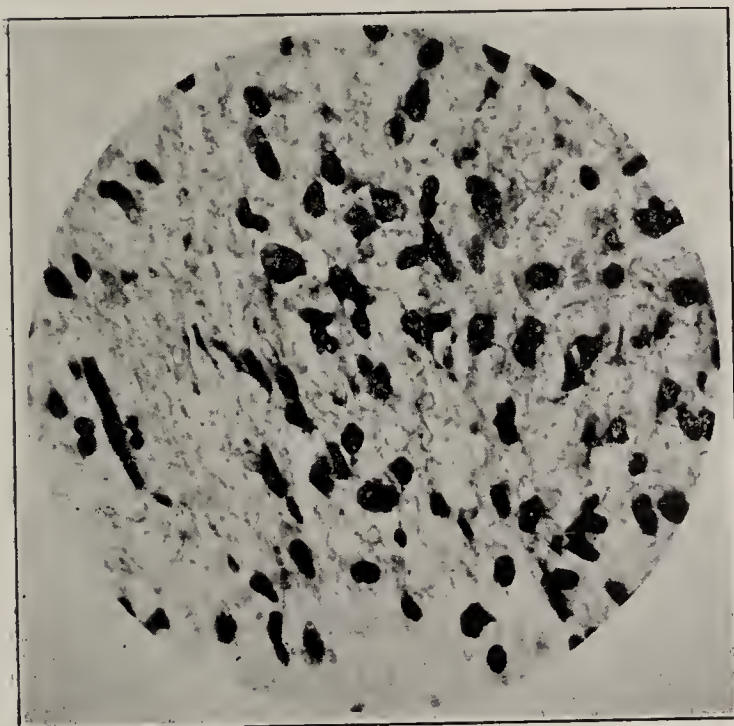


Fig 2.
Section of a glioma of the eye.

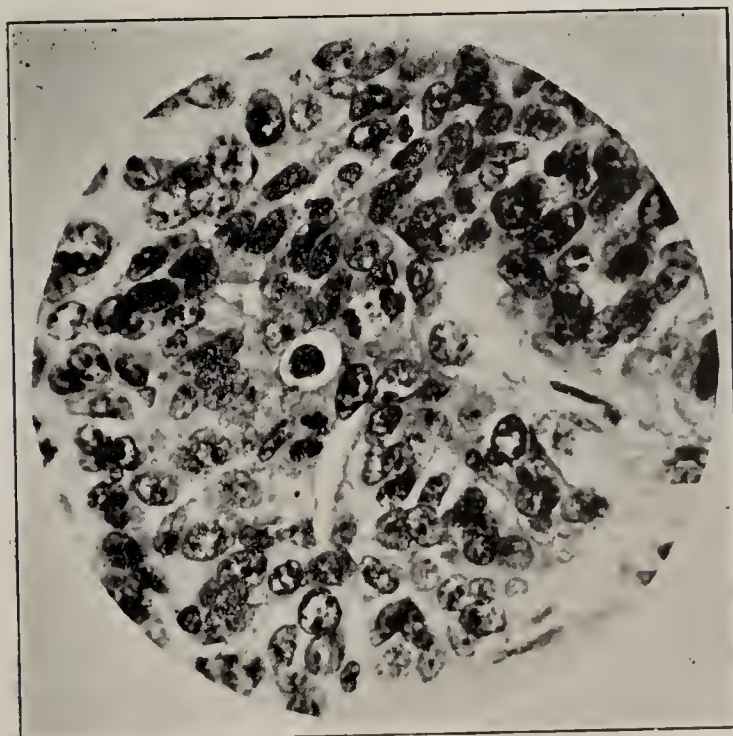


Fig 3.
Section of round-celled sarcoma showing
numerous mitoses.

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E. C. SMITH.

* Tropical Diseases Bulletin only consulted.

TUMOURS.

The number and variety of tissues received for examination was greater than usual, and these contributions from both members of the Staff and private practitioners have been greatly appreciated.

Carcinomas numbered fifteen. Eight were Epithelioma, two were glandular cancers of the liver, two were solid cancers of the cervix, one was a secondary growth at the umbilicus and one was secondary in an axillary gland. There was one endothelioma.

There were fourteen sarcomas, eleven of which were round-celled, (including a lymphosarcoma), one contained mixed cells, another was spindle-celled, and the last was a gliosarcoma. One of the cases in the round-cell group was an example of metastases in the liver, kidney, spleen and lung.

Melanomas or melanotic sarcomas numbered four, all of which were situated on the heel or the sole of the foot.

Two cases of rodent ulcer have to be added.

All the tumours occurred in native Africans except in one case of epithelioma of the upper lip, and one case of rodent ulcer, which occurred in Europeans.

Of simple tumours there were eight fibromas, four lipomas, three adenomas, three warty and two soft papillomas, a polypus of the cervix and a hæmangioma.

OTHER CONDITIONS.

Chronic inflammatory swellings numbered fourteen, non-malignant ulcers four, and there was a mesenteric cyst, a calcified mass from the mesentery, a juxta-articular nodule and a cutaneous horn.

Two cases of mycetoma of the foot and one of the elbow have been described in another part of the report.

Two *Onchocerca volvulus* tumours were received, both of which showed on section parts of the adult worm and also embryos. A portion of a free adult *O. volvulus* which had protruded from an ulcerated area on the foot of a native, was sent from Mamfe.

Three specimens of *Porocephalus* larvæ, two found free and one found encysted in the mesentery, were sent from Ilorin. The two free individuals had made their way through a hernial wound during the course of the operation.

Two adult male *Filaria loa* were also received, both of which had been obtained in the same way, *i.e.*, during an operation for inguinal hernia.

Several fresh-water snails sent from Oshogbo were kindly identified at the British Museum (Natural History) as *Physa waterloti*, Germain. Other interesting additions to the Research collection was a portion of a gallstone of an elephant, sent from Mamfe, several snakes which await identification, an aneurism of the ascending aorta and the inflamed appendix of two native Africans.

The organs in cases of malaria, relapsing fever, blackwater fever, tuberculosis, syphilis, suspected poisoning, suspected yellow fever, and suspected anthrax were also received. These included twelve specimens of kidney, nineteen specimens of liver, seventeen specimens of spleen, six of lung, four of stomach, two of heart, two of spinal cord, two of intestine, one of brain, one of pancreas and one of suprarenal. Six pieces of skin from suspected leprotic patches and nine lymphatic glands were also received.

Blood smears.—Forty-nine of these were examined, a differential leucocyte count and the Arneth Formula being obtained in twenty-one.

Other smears.—There were, from various organs twenty-seven, for gonococcus nine, for *Spironema pallidum* five, glands eight, meninges eight, tongue three and other sources six.

Eleven specimens of sputum were examined, tubercle bacilli being demonstrated in four.

Thirty-three Widal tests were performed, three of which were positive with bacillus typhosus.

Four vaccines were prepared.

Various tinned foods were examined bacteriologically.

Other investigations were of stomach contents, "native medicines," and water supplies from various sources.

A weekly bacteriological analysis of the Lagos Water Supply was done throughout the year. It was hoped to make this more than a somewhat superficial routine procedure, but unfortunately, Dr. J. A. Young, M.C., who had just begun a very promising investigation, received accidental injuries which necessitated his invaliding within a few weeks of beginning the work.

ENTOMOLOGICAL.

The Medical Officer of Health continued to send collections of the mosquito larvæ obtained by the Sanitary Inspectors on their daily rounds. The following figures deal with those larvæ collected between January and September. Table VI shows the monthly totals.

TABLE VI.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Totals.
<i>Aedes argenteus</i>	133	144	131	120	163	194	162	112	72	1,231
<i>Culex nebulosus</i>	98	103	108	101	101	135	107	71	75	899
<i>A. argenteus</i> and <i>A. luteocephalus</i>	1	...	...	1	...	1	2	...	...	5
<i>Culex fatigans</i>	3	4	...	1	...	2	...	...	1	11
<i>Aedes luteocephalus</i> ... ..	...	...	...	...	...	...	1	...	...	1
<i>C. thalassius</i> and <i>C. invidiosus</i> ... ..	...	...	...	...	1	...	...	...	...	1
<i>A. argenteus</i> and <i>C. nebulosus</i>	6	2	...	2	3	6	5	3	4	31
<i>Anopheles gambiae</i> ... ..	...	...	2	3	6	18	10	1	...	40
<i>Culex thalassius</i>	4	2	...	3	3	4	1	...	...	17
<i>An. gambiae</i> and <i>C. thalassius</i>	1	...	...	...	1	1	2	...	...	5
<i>A. argenteus</i> and <i>An. gambiae</i> ... ..	...	...	2	...	...	2	...	...	...	4
<i>A. argenteus</i> and <i>C. fatigans</i>	3	...	1	...	...	...	...	1	...	5
<i>C. nebulosus</i> and <i>An. gambiae</i> ... ..	...	...	...	...	...	2	...	...	...	2
<i>Culex duttoni</i> ... ..	...	...	1	1	1	1	2	..	...	6
<i>An. gambiae</i> and <i>C. invidiosus</i> ... ..	...	...	...	...	...	...	2	...	...	2
<i>C. nebulosus</i> and <i>Lutzia tigripes</i> ... ..	...	...	...	...	1	...	...	...	..	1
<i>A. argenteus</i> , <i>A. luteocephalus</i> , <i>C. nebulosus</i> ... ..	...	...	...	...	...	1	...	...	...	1
<i>An. gambiae</i> , <i>C. thalassius</i> , <i>C. invidiosus</i> ... ..	...	...	...	...	1	...	...	...	...	1
<i>An. gambiae</i> and <i>C. decens</i> ... ..	...	...	...	...	...	1	...	...	...	1
<i>A. argenteus</i> , <i>C. nebulosus</i> , <i>An. gambiae</i>... ..	...	...	...	...	...	...	...	1	...	1
<i>C. nebulosus</i> and <i>C. fatigans</i>	1	...	...	...	...	...	...	...	...	1
<i>Culex decens</i> ... ..	...	1	...	...	...	1	...	...	2	4
<i>A. argenteus</i> and <i>C. duttoni</i> ... ..	...	...	...	...	1	1	...	...	...	2
<i>C. nebulosus</i> , <i>C. thalassius</i> , <i>C. fatigans</i> ... ..	...	...	...	...	...	1	...	...	...	1
<i>Culex invidiosus</i> ... ..	...	...	...	...	...	1	...	...	...	1
<i>C. nebulosus</i> and <i>A. luteocephalus</i> ... ..	...	...	...	...	1	...	...	...	..	1
<i>Aedes apicoannulatus</i> .. ..	...	...	...	...	...	1	...	...	...	1
<i>An. gambiae</i> , <i>C. thalassius</i> and <i>C. nebulosus</i> ... ..	...	...	...	...	...	1	...	...	...	1
Totals	250	256	245	232	283	374	294	189	154	2,277

It will be observed that single collections of *Aedes argenteus* larvæ and of *Culex nebulosus* larvæ account for 2,130 out of the total of 2,277 collections. *Aedes argenteus* larvæ form more than half the total. *Culex nebulosus* is in the proportion of three to four of *Aedes argenteus* and forms a little more than one-third of the total. *Anopheles gambiae* would appear to be comparatively rare, occurring in only forty single collections but it has to be remembered that the real anopheline breeding areas are rather out with the path of the house-to-house inspector. *Aedes argenteus* was found breeding in association with other mosquitoes in forty-nine collections; thirty-one times in association with *C. nebulosus*, five times with *Aedes luteocephalus*, five times with *C. fatigans*, four times with *An. gambiae*, twice with *C. duttoni*, on one occasion along with both *C. nebulosus* and *Aedes luteocephalus* and on another occasion with both *C. nebulosus* and *An. gambiae*. The total number of collections, therefore, containing *Aedes argenteus* either alone or in association with other kinds of larvæ is 1,280. *Culex nebulosus* larvæ were found in association with other kinds of larvæ on forty occasions; thirty-one times with *Aedes argenteus*, twice with *An. gambiae*, and on one occasion each with *Lutzia tigripes*, *Aedes argenteus* and *A. luteocephalus*, *Aedes argenteus* and *An. gambiae*, *Culex fatigans*, *Culex thalassius* and *C. fatigans*, *Aedes luteocephalus* and with *An. gambiae* and *C. thalassius*. *Culex nebulosus* therefore figured in 939 collections altogether.

Anopheles gambiae was found in association with other kinds of larvæ on seventeen occasions; five times along with *Culex thalassius*, four times with *Aedes argenteus*, twice with *Culex nebulosus* and twice

with *Culex invidiosus*, once with *C. thalassius* and *C. invidiosus*, once with *C. decens*, once with *Aedes argenteus* and *C. nebulosus*, and once with *C. thalassius* and *C. nebulosus*.

The other mosquito-larvæ were: (1) *Culex thalassius* (twenty-six collections); (2) *Culex fatigans* (eighteen collections); (3) *Aedes luteocephalus* (eight collections); (4) *Culex duttoni* (eight collections); (5) *Culex invidiosus* (five collections); (6) *Culex decens* (five collections); and *Aedes apicoannulatus* (one collection).

The receptacles in which the larvæ were found were numerous and varied. In January, they were: Agbo Pot (*Culex nebulosus*), Banana stump (*C. nebulosus*), Barrel (*C. nebulosus* and *Aedes argenteus*), Borrow Pit (*Culex fatigans*, and *C. nebulosus*), Bottle (*A. argenteus*), Bucket, (*A. argenteus* and *C. nebulosus*), Canoe (*C. thalassius* and *An. gambiæ*), Catchpit (*A. argenteus*, *C. nebulosus*, *C. fatigans*), Cooler (*C. nebulosus*), Drain (*C. nebulosus*, *C. fatigans*), Drum (*C. nebulosus*, *A. argenteus*), Flower-Vase (*A. argenteus* and *A. luteocephalus*), Jug (*A. argenteus*, *C. nebulosus*), Kerosine tin (*C. nebulosus*), Pan (*A. argenteus*, *C. nebulosus*), Pool (*An. gambiæ*), Pot (*A. argenteus*, *C. nebulosus*, *C. fatigans*), Tin (*C. nebulosus*, *A. argenteus*) and Well (*C. nebulosus*, *A. argenteus*).

During February, the receptacles were: Barrel (*C. nebulosus*, *A. argenteus* and *C. fatigans*), Basin (*C. nebulosus*, *A. argenteus*), Bottle (*A. argenteus*), Bucket (*A. argenteus*), Calabash (*C. nebulosus*), Canoe (*C. thalassius*), Catchpit (*A. argenteus*, *C. nebulosus*, *C. fatigans*), Cooler (*A. argenteus*), Drain (*C. nebulosus*), Drum (*C. nebulosus*, *A. argenteus*), Jug (*A. argenteus*, *C. nebulosus*), Kettle (*A. argenteus*), Pan (*A. argenteus*), Pool (*A. argenteus*), Pot (*A. argenteus*, *C. nebulosus*, *C. fatigans*, *C. decens*), Tank (*A. argenteus*), Tin (*C. nebulosus*, *A. argenteus*) and Well (*A. argenteus*).

In March, the receptacles were: Barrel (*C. nebulosus* and *A. argenteus*), Bath-room floor (*C. nebulosus*), Bottle (*A. argenteus* and *C. nebulosus*), Bucket (*A. argenteus*, *C. nebulosus*), Calabash (*C. nebulosus*), Catchpit (*A. argenteus*, *C. nebulosus*), Cooler (*A. argenteus*), Drain (*C. nebulosus*, *A. argenteus*), Drum (*C. nebulosus*, *A. argenteus*), Go-cart (*C. nebulosus*), Ice chest (*A. argenteus*), Motor Tyre (*C. nebulosus*, *A. argenteus*), Pan (*C. nebulosus*, *A. argenteus*, *C. fatigans*), Pool (*An. gambiæ*, *A. argenteus*, *C. nebulosus*), Pot (*A. argenteus*, *C. nebulosus*, *An. gambiæ*), Tin (*A. argenteus*, *C. nebulosus*, *C. duttoni*, *An. gambiæ*) and Well (*C. nebulosus*, *A. argenteus*).

In April, the receptacles were: Agbo pot (*C. nebulosus*), Barrel (*C. nebulosus*, *A. argenteus*), Bath-room floor (*C. nebulosus*), Bucket (*A. argenteus*, *C. nebulosus*), Calabash (*C. nebulosus*, *An. gambiæ*), Canoe (*C. thalassius*), Catchpit (*A. argenteus*, *C. nebulosus*), Drum (*A. argenteus*), Kettle (*A. argenteus*, *C. nebulosus*), Pot (*A. argenteus*, *C. nebulosus*, *C. fatigans*, *A. luteocephalus*, *C. duttoni*, *An. gambiæ*), Tank (*A. argenteus*), Tea-pot (*A. argenteus*), Tin (*A. argenteus*, *C. nebulosus*, *An. gambiæ*) and Well (*C. nebulosus*, *A. argenteus*, *C. thalassius*).

In May, the receptacles were: Banana stump (*A. argenteus*), Barrel (*C. nebulosus*, *A. argenteus*, *C. thalassius*, *C. invidiosus*), Bath-room floor (*A. argenteus*), Borrow-pit (*A. argenteus*), Bottle (*A. argenteus*, *C. nebulosus*), Bucket (*A. argenteus*), Calabash (*C. nebulosus*), Canoe (*C. thalassius*), Catchpit (*A. argenteus*, *C. nebulosus*, *An. gambiæ*), Cooler (*C. nebulosus*), Corrugated Iron sheet (*A. argenteus*), Drum (*A. argenteus*, *C. nebulosus*, *L. tigripes*), Go-cart (*A. argenteus*), Jug (*A. argenteus*), Kerosine Tin (*A. argenteus*), Kettle (*C. nebulosus*), Mortar (*C. nebulosus*), Motor Tyre (*C. nebulosus*, *A. argenteus*), Pan (*A. argenteus*, *C. nebulosus*), Pool (*An. gambiæ*, *C. thalassius*, *C. invidiosus*), Pot (*A. argenteus*, *C. nebulosus*, *C. duttoni*, *An. gambiæ*, *C. thalassius*), Sharping Stone (*C. nebulosus*), Swamp (*An. gambiæ*), Tank (*A. argenteus*), Tin (*C. nebulosus*, *A. argenteus*) and Well (*A. argenteus*).

During June, the receptacles were : Agbo pot (*C. nebulosus*), Barrel (*C. nebulosus*, *A. argenteus*), Bath-room Floor (*A. argenteus*), Bucket (*A. argenteus*, *C. nebulosus*), Calabash (*C. fatigans*), Canoe (*C. thalassius*, *An. gambiæ*, *A. argenteus*), Catchpit (*A. argenteus*, *C. nebulosus*, *An. gambiæ*, *C. duttoni*), Hollow in cement (*A. argenteus*, *C. nebulosus*), Cooler (*A. argenteus*), Demijohn (*A. argenteus*), Drum (*A. argenteus*, *C. nebulosus*, *A. luteocephalus*), Flower vase (*A. argenteus*, *C. nebulosus*), Gutter (*A. argenteus*), Ice-chest (*A. argenteus*), Jug (*C. nebulosus*), Kerosine tin (*C. nebulosus*), Kettle (*A. argenteus*, *C. nebulosus*), Lighter (*C. nebulosus*), Mortar (*A. argenteus*), Motor Tyre (*C. nebulosus*, *A. argenteus*), Pan (*A. argenteus*), Pool (*An. gambiæ*, *C. decens*, *C. thalassius*, *C. nebulosus*), Pot (*A. argenteus*, *C. nebulosus*, *C. decens*, *A. luteocephalus*, *An. gambiæ*, *C. duttoni*, *C. fatigans*, *C. thalassius*, *C. invidiosus*), Swamp (*An. gambiæ*, *C. nebulosus*), Tank (*A. argenteus*), Tin (*C. nebulosus*, *A. argenteus*, *An. gambiæ*), Tree-hole (*A. apicoannulatus*), Tug (*A. argenteus*), Watering Can (*A. argenteus*) and Well (*C. nebulosus*, *A. argenteus*, *C. fatigans*).

During July, the receptacles were : Agbo pot (*A. argenteus*), Banana stump (*A. luteocephalus*, *A. argenteus*), Barrell *A. argenteus*, *C. nebulosus*, *A. luteocephalus*), Bath-room floor (*A. argenteus*, *C. nebulosus*), Burrow pit (*An. gambiæ*), Bottle (*A. argenteus*), Bucket (*A. argenteus*, *C. nebulosus*), Calabash (*A. argenteus*), Canoe (*C. nebulosus*, *An. gambiæ*, *A. argenteus*), Catchpit (*A. argenteus*, *C. nebulosus*), Cooler (*A. argenteus*, *C. nebulosus*), Corrugated Iron Sheet (*A. argenteus*), Dish (*A. argenteus*, *C. nebulosus*), Drain (*C. nebulosus*, *A. argenteus*, *An. gambiæ*, *C. invidiosus*), Drum (*A. argenteus*, *C. nebulosus*), Filter (*A. argenteus*), Flower Vase (*C. nebulosus*), Gutter (*A. argenteus*), Horn (*C. nebulosus*, *A. argenteus*), Jug (*A. argenteus*, *C. nebulosus*), Kettle (*A. argenteus*), Mortar (*A. argenteus*), Motor Tyre (*A. argenteus*, *C. nebulosus*), Pan (*C. nebulosus*, *A. argenteus*), Pool (*An. gambiæ*, *C. thalassius*, *C. invidiosus*), Pot (*A. argenteus*, *C. nebulosus*, *A. luteocephalus*, *C. duttoni*, *An. gambiæ*), Tank (*A. argenteus*, *C. nebulosus*), Tea-pot (*C. nebulosus*, *A. argenteus*), Tin (*C. nebulosus*, *A. argenteus*) and Well (*C. nebulosus*, *A. argenteus*).

The receptacles in August were : Barrel (*A. argenteus*, *C. nebulosus*), Bottle (*A. argenteus*, *C. nebulosus*), Bucket (*A. argenteus*, *C. nebulosus*), Calabash (*A. argenteus*), Canoe (*C. nebulosus*, *An. gambiæ*), Catchpit (*A. argenteus*, *C. nebulosus*), Drain (*C. nebulosus*, *A. argenteus*), Drum (*A. argenteus*, *C. nebulosus*), Flower Vase (*A. argenteus*), Kettle (*A. argenteus*), Oil Can (*C. nebulosus*), Pan (*A. argenteus*, *C. nebulosus*, *An. gambiæ*), Pot (*A. argenteus*, *C. nebulosus*, *C. fatigans*), Tank (*A. argenteus*), Tea-pot (*A. argenteus*, *C. nebulosus*), Tin (*C. nebulosus*, *A. argenteus*) and Well (*A. argenteus*).

In September (up to and including 22nd September), the receptacles were : Agbo pot (*C. nebulosus*), Barrel (*A. argenteus*, *C. nebulosus*), Basin (*A. argenteus*), Bottle (*A. argenteus*, *C. nebulosus*), Bucket (*A. argenteus*, *C. nebulosus*), Catchpit (*A. argenteus*, *C. nebulosus*), Drum (*C. nebulosus*, *A. argenteus*), Gutter (*A. argenteus*), Jug (*A. argenteus*), Motor Tyre (*C. nebulosus*, *A. argenteus*), Pan (*A. argenteus*, *C. nebulosus*), Pot (*A. argenteus*, *C. nebulosus*, *C. fatigans*), Tin (*A. argenteus*, *C. nebulosus*), Sharping Stone (*C. nebulosus*, *A. argenteus*), and Well (*C. nebulosus*, *A. argenteus*, *C. decens*).

It will be observed that the number of mosquitoes represented in the collections is eleven, namely, *Aedes argenteus*, *Aedes luteocephalus*, *Aedes apicoannulatus*, *Culex nebulosus*, *Culex invidiosus*, *Culex duttoni*, *Culex decens*, *Culex thalassius*, *Culex fatigans*, *Lutzia tigripes* and *Anopheles gambiæ*. The receptacles were : Agbo pot (fourteen collections, *C. nebulosus*, *A. argenteus*); Banana stump (five collections, *C. nebulosus*, *A. argenteus* and *A. luteocephalus*), Barrel (107 collections, *C. nebulosus*, *C. fatigans*, *A. argenteus*, *A. luteocephalus*, *C. thalassius*

and *C. invidiosus*); Basin (three collections, *C. nebulosus*, *A. argenteus*); Bath-room floor (ten collections, *C. nebulosus* and *A. argenteus*); Borrow-pit (seven collections, *C. nebulosus*, *C. fatigans*, *A. argenteus*, *An. gambiæ*); Bottle (sixteen collections, *A. argenteus*, *C. nebulosus*); Bucket (forty-seven collections, *A. argenteus*, *C. nebulosus*, *C. fatigans*); Calabash (ten collections, *A. argenteus*, *C. nebulosus*, *C. fatigans*, *An. gambiæ*); Canoe (twenty-five collections, *C. thalassius*, *C. nebulosus*, *An. gambiæ*, *A. argenteus*); Catchpit (183 collections, *A. argenteus*, *C. nebulosus*, *C. fatigans*, *An. gambiæ*, *C. duttoni*); Cement hollow (two collections, *A. argenteus*, *C. nebulosus*); Cooler (ten collections, *A. argenteus*, *C. nebulosus*); Corrugated Iron Sheet (two collections, *A. argenteus*); Demijohn (one collection, *A. argenteus*); Dish (two collections, *A. argenteus*, *C. nebulosus*); Drain (seventeen collections, *C. nebulosus*, *C. fatigans*, *C. invidiosus*, *A. argenteus*, *An. gambiæ*); Drum (seventy-three collections, *C. nebulosus*, *A. argenteus*, *L. tigripes*, *A. luteocephalus*); Filter (one collection, *A. argenteus*); Flower Vase (six collections, *A. argenteus*, *A. luteocephalus*, *C. nebulosus*); Go-cart (two collections, *C. nebulosus*, *A. argenteus*); Gutter (four collections, *A. argenteus*); Horn (two collections, *A. argenteus*, *C. nebulosus*); Ice-chest (two collections, *A. argenteus*); Jug (fifteen collections, *A. argenteus*, *C. nebulosus*); Kerosine tin (three collections, *C. nebulosus*); Kettle (thirteen collections, *A. argenteus*, *C. nebulosus*); Lighter (one collection, *C. nebulosus*); Mortar (three collections, *C. nebulosus*, *A. argenteus*); Motor Tyre (twenty-five collections, *C. nebulosus*, *A. argenteus*); Oil Can (one collection, *C. nebulosus*); Pan (thirty collections, *C. nebulosus*, *C. fatigans*, *A. argenteus*); Pool (thirty-two collections, *An. gambiæ*, *A. argenteus*, *C. nebulosus*, *C. thalassius*, *C. invidiosus*, *C. decens*); Pot (1,332 collections, *A. argenteus*, *A. luteocephalus*, *C. nebulosus*, *C. fatigans*, *C. decens*, *C. duttoni*, *C. invidiosus*, *C. thalassius*, *An. gambiæ*); Tank (fifteen collections, *A. argenteus*, *C. nebulosus*); Tea-pot (six collections, *A. argenteus*, *C. nebulosus*); Tin (172 collections, *C. nebulosus*, *C. duttoni*, *A. argenteus*, *A. luteocephalus*, *An. gambiæ*); Tree-hole (one collection, *A. apicoannulata*); Tub (two collections, *A. argenteus*); Sharping stone (two collections, *C. nebulosus*, *A. argenteus*); Swamp (three collections, *An. gambiæ*, *C. nebulosus*); Watering-can (one collection, *A. argenteus*); Well (seventy collections, *C. nebulosus*, *C. thalassius*, *C. decens*, *C. fatigans*, *A. argenteus*).

There were therefore forty-three different kinds of receptacles or breeding places. The house-hold pots were the most prolific source of larvæ, catchpits, tins, barrels and drums being also common sources. The pot also supplied the largest variety of larvæ.

BLOOD-SUCKING FLIES IDENTIFIED.

Anopheles gambiæ 356♂♂ 225♀♀.

Culex decens 4♀♀.

Aedes argenteopunctatus 1♀.

Sent by Mr. F. D. Evans, collected at Ikoyi.

Anopheles gambiæ 13♂♂.

Culex thalassius 1♀.

Sent by Mrs. Hall, collected at Ikoyi.

Anopheles domicolus 1♀.

Sent by Dr. M. Morrison, Kontagora.

Glossina palpalis 1♀.

Hæmatopota cordigera 1♀.

Hæmatopota lacesens 3♀♀.

Tabanus secedens 1♀.

Sent by Dr. Pollard, Kaduna.

Hæmatopota lacesens 1 ♀.

Anopheles gambiæ 5 ♀ ♀.

Sent by Dr. Stephens, Ilorin.

Aedes irritans 4♂♂ 21 ♀ ♀.

Culex nebulosus 11♂♂ 7 ♀ ♀.

Culex decens 1♂.

Aedes nigricephalus 1♂ 5 ♀ ♀.

Tæniorhynchus africanus 1 ♀.

Uranotænia annulata 3 ♀ ♀.

Anopheles gambiæ 1♂.

Culex univittatus 2 ♀ ♀.

Ingramia circumtestacea 1 ♀.

Rhipicephalus sanguineus, a large collection.

Sent by Dr. Turner, Lagos.

DISSECTION OF BLOOD-SUCKING FLIES.

February.

Anopheles gambiæ 168 ♀ ♀.

One specimen had larval filariæ in muscles of thorax and head and also sporozoits in the salivary glands. All others were negative.

Tæniorhynchus africanus ... 216 ♀ ♀.

All negative.

Culex duttoni ... 2 ♀ ♀.

Both negative.

March.

Anopheles gambiæ ... 200 ♀ ♀.

One specimen had sporozoits in the salivary glands and zygotes on the stomach wall. Another specimen had sporozoits in the salivary glands. A third had larval filariæ in the proboscis. All others were negative. The salivary glands in one of these was peculiar in that on one side the middle lobe was very large and the two lateral lobes were shrivelled, while on the other side the structure was normal.

Culex thalassius ... 6 ♀ ♀.

Culex duttoni ... 5 ♀ ♀.

Tæniorhynchus africanus ... 4 ♀ ♀.

Anopheles pharænsis ... 1 ♀

Aedes luteocephalus ... 1 ♀.

Culex nebulosus ... 1 ♀.

All negative

April.

Anopheles gambiæ ... 91 ♀ ♀.

Two had larval filariæ in the thoracic muscles (one a very heavy infection).

One had larval filariæ in the thoracic and neck muscles.

One had sporozoits in the salivary glands.

All others negative.

Culex thalassius	26 ♀ ♀.
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Tæniorhynchus africanus	2 ♀ ♀.
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Culex duttoni	1 ♀ ♀.
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Aedes irritans	1 ♀.
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Glossina palpalis	1 ♀.
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All negative.

May.

Anopheles gambiae	122 ♀ ♀.
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Two had larval filariæ in the thoracic muscles.

One had larval filariæ in the cephalic and thoracic muscles, a heavy infection.

One had apparently a double infection, short stumpy forms in the thoracic muscles, long slender and active in the abdominal muscles.

One had larval filariæ only in the cephalic muscles.

All others negative.

Culex thalassius	9 ♀ ♀.
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Two showed active spirochætes in the stomach contents. The others were negative.

Tæniorhynchus africanus	5 ♀ ♀.
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Aedes irritans	1 ♀.
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Aedes nigricephalus	1 ♀.
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All negative.

June.

Anopheles gambiae	42 ♀ ♀.
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One showed sporozoits in the salivary glands. All the others were negative.

Tæniorhynchus africanus	8 ♀ ♀.
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Culex thalassius	1 ♀.
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All negative.

July.

Tæniorhynchus africanus	10 ♀ ♀.
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One showed spirochætes in the stomach contents.

All others negative.

Anopheles gambiae	6 ♀ ♀.
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Culex thalassius	4 ♀ ♀.
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Glossina palpalis	2 ♀ ♀.
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Culex grahami	1 ♀.
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Aedes irritans	1 ♀.
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All negative.

August.

Tæniorhynchus africanus 14 ♀ ♀.

Culex thalassius 1 ♀.

All negative.

September.

Tæniorhynchus africanus 3 ♀ ♀.

Culex thalassius 1 ♀.

All negative.

All the above mosquitoes were brought by the labouring staff. They were caught in the labourers' houses. The larval filariæ corresponded very closely to the developmental forms of *filaria bancrofti*.

Several attempts were made to induce the sporozoits from the salivary glands to enter red cells in freshly drawn human blood. The gland was quickly transferred to a drop of blood on a slide, sometimes mixed with saline, sometimes mixed with citrate, sometimes undiluted, a cover-glass was lightly dropped on the slide and the whole was kept in a moist cell, in the incubator at 38°C. In no single instance were the attempts successful.

OTHER DISSECTIONS.

June.

Anopheles gambiæ 64 ♀ ♀ from Mr. Evans.

„ „ 10 ♀ ♀ from Major Nunn.

All taken at Ikoyi. Zygotes on stomach wall of one, spirochætes in stomach contents of one.

Cimex rotundatus, caught in labourer's room, many hundreds dissected (probably about 400) all negative.

21 *Musca*, all negative.

3 *Pycnosoma*. Many flagellates in intestinal contents of one, many spirochætes in stomach contents of another.

1 *Sarcophaga*, several large amœbæ in stomach contents.

July.

94 *Musca*, eight had flagellates, one had a heavy infection of nematodes and one had spirochætes.

1 *Sarcophaga* had flagellates also.

3 *Pycnosoma*.

2 *Anthomyids*, negative.

August.

35 *Musca*, two had flagellates and one had a large amœba. Four had numerous fungal spores.

1 *Pycnosoma*, numerous flagellates

Stomoxys calcitrans 3, *S. nigra* 1 and *S. omega* 1, also a *Hippoboscid*, negative.

Insects attracted to light at night.—Through the kindness of G. Wilson, Esq., vaselined hurricane lanterns were placed in various spots in the Nigerian Dry Dock, and left burning all night. The following were the findings:

In Lighter, on shore, 145 Phlebotomus, one Culicoides, four psychodids, one Culex and many non-blood-suckers.

On open shore near high-water mark, fifteen Phlebotomus, six other insects.

On dry-dock, in stream. No Phlebotomus.

In low bush near beach, eleven Phlebotomus, thirty-four other insects.

On beach north of dock, seven Phlebotomus, thirty Culicoides, thirty other insects.

On beach south of dock, one Culicoides, one Aedes irritans, ten other insects.

On small steamer inside dry-dock, twenty-seven Culicoides, one Phlebotomus, seven other insects.

Ectoparasites of Rodents in Lagos.—These have already been described in the Rat Plague section. Their identification was done in the Entomological Department.

The observations on the variations occurring in *Aedes argenteus*, Poiret, in Lagos which were detailed at some length in the Annual Report, 1926, were published in the Bulletin of Entomological Research, Volume XVIII, Part 1, September, 1927, pp.5-11.

Reproductions of some of the actual photographs are attached.

S. L. M. SUMMERS CONNAL.

ACKNOWLEDGMENTS.

The following sent material or information or both and are cordially thanked:—

Dr. Aitken, Dr. Boucher, Dr. Braithwaite, Dr. Brierley, Dr. Caffrey, Dr. Carson, Dr. Cauchi, Dr. G. Clark, Dr. Cobb, D.S.O., Dr. Courtney, Dr. Crichton, Dr. Cullen, Dr. Digby, Dr. Dilke, M.B.E., Dr. Don, Dr. Dyce Sharp, Dr. Ebdon, Dr. Elmes, Mr. Evans, Dr. Ferguson, Dr. Fitzgerald Moore, Dr. Forde, Dr. Fowler, Dr. Fraser, Dr. Gallagher, Dr. Glover, Dr. Gray, Dr. Grey, Dr. Grieve, Mrs. Hall, Dr. Innes (Gambia), Dr. Keer, Dr. Kelsall, Dr. Lindsay, Dr. Lockett, Dr. McCon, Dr. McGrath, Dr. MacGregor, Dr. Mackay, Dr. Mackey, Dr. MacLaine, Dr. Maples, Dr. Martyn-Clarke, Dr. Miller, Dr. M. Morrison, Dr. Murray, Dr. Naudi, Dr. Nelson, Dr. Newport, Major Nunn, Dr. O'Carroll, Dr. Oluwole, Dr. Paisley, Dr. Pasqual, Dr. Pearson, Mr. Peaston, Dr. Pollard, Major Price, Dr. Ramsay, Dr. Ross, Dr. Savage, Dr. Selby, Dr. C. J. Sharp, M.C., Dr. Stephens, Dr. Steven, Dr. Thomson, Dr. Turnbull, Dr. Turner, Dr. Waldron, M.C., Dr. Walker, Dr. Waller, and Dr. Wynne-Davies, O.B.E.

THE ABDOMINAL MARKINGS OF *ÆDES (STEGOMYIA) ARGENTEUS*.



Black, without
bands, only
white lateral
spots.

White basal
bands narrow.

White basal
bands broad.

Very narrow
white basal
bands.



Narrow apical
white bands.

Basal and
apical bands.

Basal and
apical bands
broad.

Basal and
apical bands,
also a few
scattered white
scales.



Basal and apical
bands and white
median line.

Basal bands
broad, apical
bands narrow,
scattered white
scales.

Basal and
apical bands
equal in width.

Basal and
apical bands
equal, scattered
white scales.

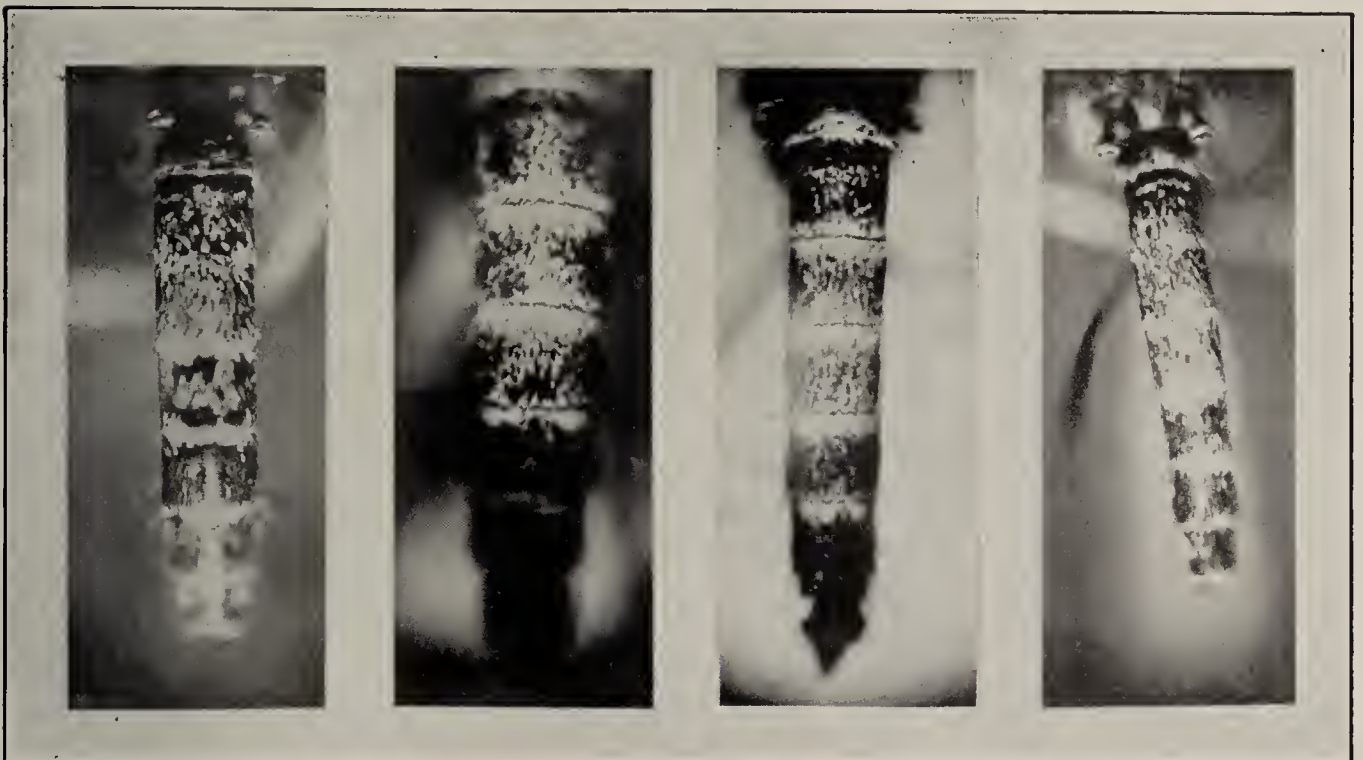


“ Brindled ”
peppered with
white and
black scales.

Peppered white
scales more
numerous than
black.

White scales on
first three seg-
ments in form
of hour-glass.

As in previous
photograph.



Various “ Brindled ” Specimens with more white than black scales.



Abdomen practically all white.

